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FOREWORD.

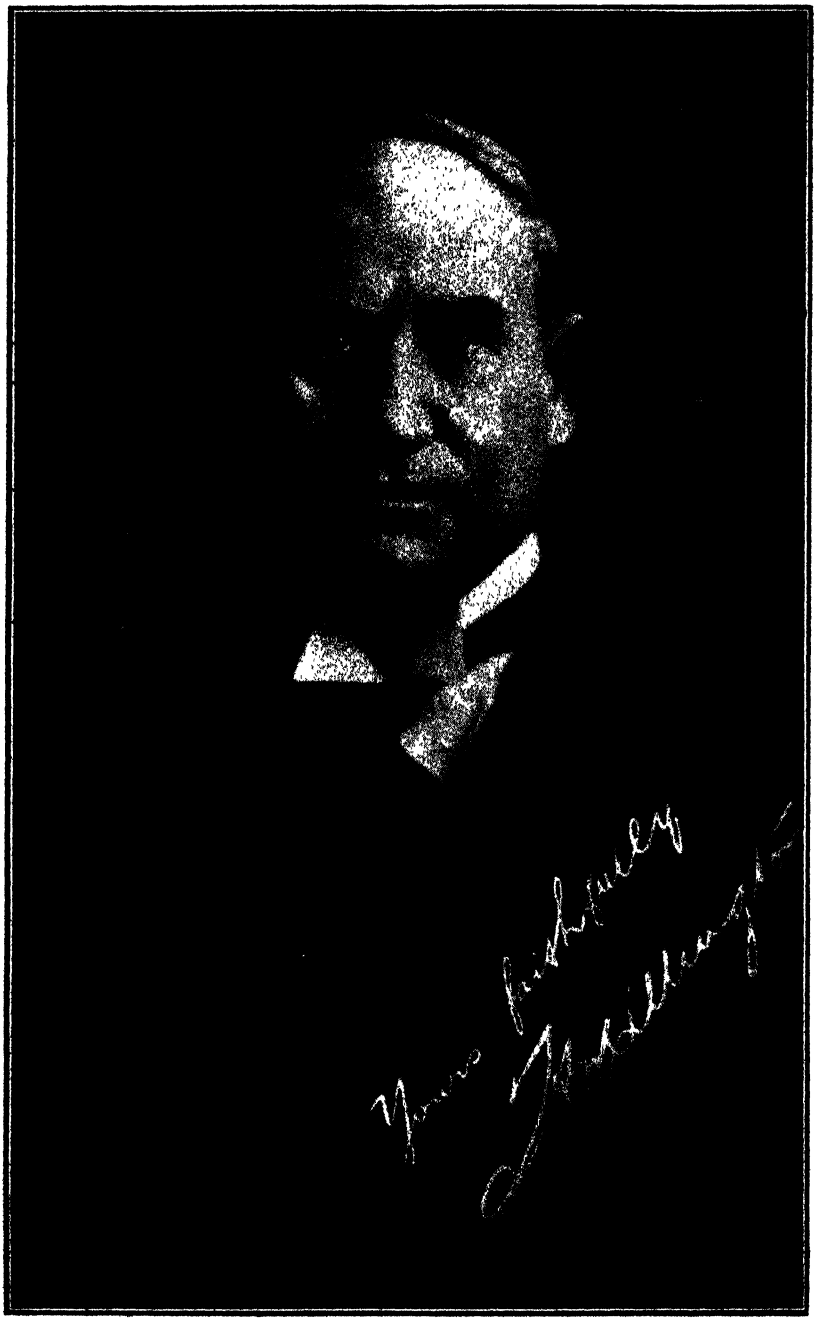
To Readers of the "Journal of the Department of Agriculture."

In assuming Ministerial control of the Department of Agriculture I would like to take the opportunity of assuring the many readers of the "Journal" of the deep interest I take in the work allotted to me. Moreover, I am sensible of the responsibility with which I am entrusted and its importance in relation to our production and commerce. I enter upon my duties impelled by a forceful desire to carry on the magnificent work of multiplying the products of our territory. I have watched with pleasure the rapid progress made during the past decade, and it will be my privilege and pleasure to go on ever seeking to add to our production by activity within the field of experiment and research, and to increase the store of knowledge thus acquired for the benefit of farmers in all branches of the industry.

The tradition of the Department of Agriculture is essentially that of Service, and it will be my pride, and my most earnest endeavour, to further extend the benefits of that service to all engaged in the agricultural, horticultural and pastoral pursuits of the State.

Faithfully yours,

H Millington



The Minister for Agriculture,
Hon. H. Millington, M.L.A.

THE FIRST AUSTRALIAN STUDMASTER AND HIS FLOCK.

GEO. L. SUTTON,
Director of Agriculture.

About the year 1795 a young lieutenant in the New South Wales corps—John Macarthur—stationed in the infant colony of New South Wales, conceived an idea that was destined to have the most far-reaching beneficial effects upon the prosperity not only of the colony then only seven years old, but also that of the future Commonwealth of Australia. The idea, which was to prove as sound as it was deemed then to be absurd, was that the climatic and other natural conditions found in New South Wales were suitable for the production of fine wool, *i.e.*, Merino wool.

The general impression of Macarthur's contemporaries was entirely the opposite, largely in consequence of the disastrous results which had followed upon the landing of the sheep which were brought out by the first fleet in 1788. In connection with these Coghlan states:—* "Forty-four sheep were landed from the First Fleet in 1788. Sickness attacked them immediately, and they were greatly worried by the dingoes, so that at the end of three months fifteen were dead, and the mischief continued until only one was left."

Though later importations fared better, yet for probably more than a quarter of a century the general impression was that the country was better adapted for the production of mutton than for wool. It was then considered that the Merino was not hardy enough to thrive under the natural conditions, and for which the Southdown and other mutton breeds were considered more suitable, and particularly when used for crossing with the common type of ewe available, viz., the Bengal and Cape sheep, which produced such a coarse fleece that it was described at the time as "hair." As illustrating the general opinion which prevailed, it is interesting to quote from the report of Edward Wood made to Governor King on September 3rd, 1805. Edward Wood was a professional wool classer (presumably wool sorter) who had been induced by Macarthur to settle in New South Wales, and who accompanied the latter in the "Argo" from England in 1804; he had been instructed by Governor King to inspect, examine and report upon the wool of the different flocks in the colony. He states —† "It is with concern, however, that I observe this great national object (*i.e.*, the production of fine wool) may be many years retarded by an unaccountable prejudice which appears to prevail in favour of weight of carcase instead of fineness of fleece, and on this account a decided preference in favour of a cross that, I understand, has been obtained from a Southdown ram."

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*(a) "Labor & Industry in Australia," Vol. 1, 1918.
(b) "Australian Merino Studs," 1904—Bruni.

† "Early Records of the Macarthurs of Camden."

Capt. John Macarthur,

The First Australian Studmaster.

(Reproduced from "Early Records of the Macarthurs of Camden."

By courtesy of Miss Sibella Macarthur Onslow.)

The outlook for sheep husbandry was obviously the reverse of bright when young Macarthur arrived with the second fleet in June, 1790, and apparently he did not interest himself in sheep until three or four years later. In his evidence before Commissioner Bigge in 1820 he stated—*"In the year 1794 I purchased from an officer sixty Bengal ewes and lambs, which had been imported from Calcutta, and very soon after I procured from the Captain of a transport from Ireland two Irish ewes and a young ram. The Indian sheep produced coarse hair and the wool of the Irish sheep was then valued at no more than 9d. per lb. By crossing the two breeds I had the satisfaction to see the lambs of the Indian ewes bear a mingled fleece of hair and wool—*this circumstance originated the idea of producing fine wool in* New South Wales."

Opposed as it was to the prevailing opinion of the time, the idea was extremely original, and, in view of the unpromising stock to work upon, remarkably courageous, particularly for a young man of 28. It was a conception of genius and at once stamps Macarthur as a man of broad vision. As pointed out later by his grand-daughter—Mrs. Elizabeth Macarthur Onslow—in "Some Early Records of the Macarthurs of Camden," "Although quite a young man he had the sagacity to comprehend that a petty population, established at so vast a distance from other civilised parts of the globe, could have no prospect of ultimately succeeding unless by raising as an export some raw material, which would be produced with little labour, be in considerable demand, and be capable of bearing the expense of a long sea voyage; that only by the production of some such commodity, whatever might be the natural fertility of the country, could it hope to escape the alterations of abundance and scarcity even of bread. This for a young subaltern was a bold and original view of the circumstances of the infant colony, then wholly dependent on the Mother Country even for its daily bread. He could imagine no article so completely fulfilling the necessary conditions as fine wool, and his setting earnestly to work to produce this made him an object of ridicule to his comrades, who were profiting by raising meat, and subsequently of opposition and oppression from his superiors."

Having conceived the idea of producing fine wool, it is obvious that a man of Macarthur's tenacity would immediately proceed to develop it and with determination. Consequent upon the improvement which had taken place as the result of mating the "Indian" or "hair bearing" sheep with a ram not remarkable for the quality of its wool, it is obvious that a man of Macarthur's ability would conclude that a still greater improvement would take place if rams producing finer wool were mated with the common sheep. At that time the finest wool was obtained from Spain, the produce of the Merino, the distinguishing characteristic of which was its covering of very fine wool, usually delicately crimped. It is not difficult to imagine that Macarthur, primarily with the object of improving his coarse-woolled flock, would begin immediately to plan to obtain some Merino sheep, and, if possible, in the colony. It is recorded that Major Johnson, who came out in command of the Marines in the First Fleet, brought with him a Merino ram, for Captain Waterhouse wrote about 1806—"Major Johnson carried out a Spanish ram from England presented by the Duke of Northumberland." * This ram was, therefore, the first Merino to come to Australia; he was, however, evidently included amongst the forty-three out of the forty-four sheep which perished, for no later reference to this animal can be traced. As the desired Merinos could not be secured in New South Wales, Macarthur without doubt endeavoured to obtain them elsewhere. Obviously this was the case for we learn that in 1796, or early in 1797, when the two sloops of war, the "Reliance' (Captain Waterhouse) and the "Supply" (Captain Kent) were ordered to the Cape of Good Hope for supplies, Macarthur entrusted the commanders Captains Waterhouse and Kent, who were friends of his, with a commission to inquire if there were any wool bearing sheep, *i.e.*, Merinos, at the Cape, and if possible secure some. On arrival at the Cape of Good Hope it was found that the widow of Colonel Gordon had some Merino sheep—presumably from Holland—for sale. These were secured. The details of their acquisition and their transport to New South Wales and disposal there can best be told in the words of Captain Waterhouse himself in what is believed to be the draft of a letter to Sir Joseph Banks, and found on the back of a letter from that gentleman to Captain Waterhouse and dated July, 1806, asking for particulars regarding the bringing of the Cape Merinos to New South Wales. He wrote - *"Having hurt my hand on the way down here is the reason I have not answered yours sooner respecting the Spanish sheep. In 1797 I arrived at the Cape of Good Hope together with the 'Supply' (Capt. Kent) and 'Britannia,' transport. On board the 'Reliance' was the Commissary for the purpose of purchasing cattle for the colony; and on board the 'Britannia' Governor King and Col. Paterson on their way to England, both of which gentlemen had been acquainted with Col. Gordon, who had lately lost his life. Col. Gordon had imported a few Spanish sheep into the Cape, which had increased to 32. Mrs. Gordon was then going to Europe, and, for some reason, did not choose to leave anything that had belonged to her late husband at the Cape. She gave three Spanish sheep to Governor King and three to Colonel Paterson; the remainder, I understood, were offered to the Commissary, but he declined to purchase them on the part of the Government. They were then offered to me. As I could not afford to purchase the whole, Captain Kent, that they might not be lost to the Colony, offered to take half. We each received 13, and I took Governor King's on board the 'Reliance.' Colonel Paterson took his to England, I understood, as a present to Sir J. Sinclair. We paid Mrs. Gordon £4 or four guineas apiece for them; the expenses on delivery were about £1 a head more. The expenses for feed on the passage were very considerable. Unfortunately Governor King's three had been brought to Cape Town before ours, and put with some others, by which they became diseased and communicated it to ours. Those three died soon after they came on board. I do not recollect the number I had alive on my arrival, but I think more than half. Captain Kent, who had shared, I understood, his with Lieutenant Braithwaite, I believe lost all his from the circumstances of his applying to me for one immediately on my arrival. I do not recollect if Lieutenant Braithwaite had one or two alive. I offered all mine to the Governor; but I suppose he was satisfied that they were in the colony, as he declined purchasing them. Captain Macarthur then offered me fifteen guineas a head if I would let him have the whole; this I declined, wishing to distribute them. I supplied Captain Kent, Captain Macarthur, Mr. Marsden and Mr. Laycock, as the Spanish ewes had lambs (none but Spanish rams running with them). I supplied Mr. Williamson, Captain Rowley, Mr. Moore, Governor, and, in fact, any person who wished to have them. I never had any other than Spanish rams with my flock; and, on my quitting the colony, I sold the flock to Mr. Cox, the paymaster, with the exception of a few to Captain Macarthur. Most persons who had Spanish sheep were particular about them, and I can assert that several of the Spanish sheep I originally brought from the Cape, together with their produce, were in the flock I left behind."

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* "Early Records of the Macarthurs of Camden."

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* Australian lean Merino Studs, 1904.—Bruni.

It is obvious from the concluding sentence regarding those retained by Captain Waterhouse that he had not used the Merino sheep obtained from the Cape as the nucleus of a stud flock, but like a good flock master had mated to them his sheep of Bengal and mixed origin to improve the latter.

It is also evident that the Rev. Samuel Marsden did not use the Merinos obtained from Captain Waterhouse to form a stud, but like the latter, used them with his general flock. *"He was aiming"—as stated in a report to Governor King in 1905—"to improve the constitution of the sheep, the weight of the carcases and the quality of the wool . . . . " "One true bred Spanish ram and ewe with four half-bred Southdown rams have been the sheep that have improved my flock very far beyond my expectations, in beauty, constitution, weight and fleece. As far as my own observations have gone I have always considered the pure Spanish breed much more delicate in their constitution and lighter in carcase than the produce of ewes crossed with the Spanish or half-bred Southdown rams."

Marsden's view that it was better to breed for mutton than for wool was the general view of those then interested in sheep raising in New South Wales. The flock master preferred the mixed Cape and Bengal sheep to the Merino because it bred more rapidly and had a larger carcase. Macarthur's attempt to grow fine wool was generally regarded with derision and looked upon as an amusing fad. Many laughed in their sleeves and said—†"His wits were a-woolgathering."

Learning as we do from Macarthur's subsequent actions how anxious he was to translate quickly his convictions into realities, it is easy to realise how keen he was to get all the Merino sheep secured from the Cape. This, however, was not to be; with the foresight of a far-seeing business man he prepared to make himself independent of outside sources for the material necessary to improve his flocks, and enable him to produce the fine wool for which, he believed, the natural conditions of the colony to be so specially suited.

With the intuition of the true stud master he decided to keep the Merinos separate from the other sheep and raise rams which could be used for the

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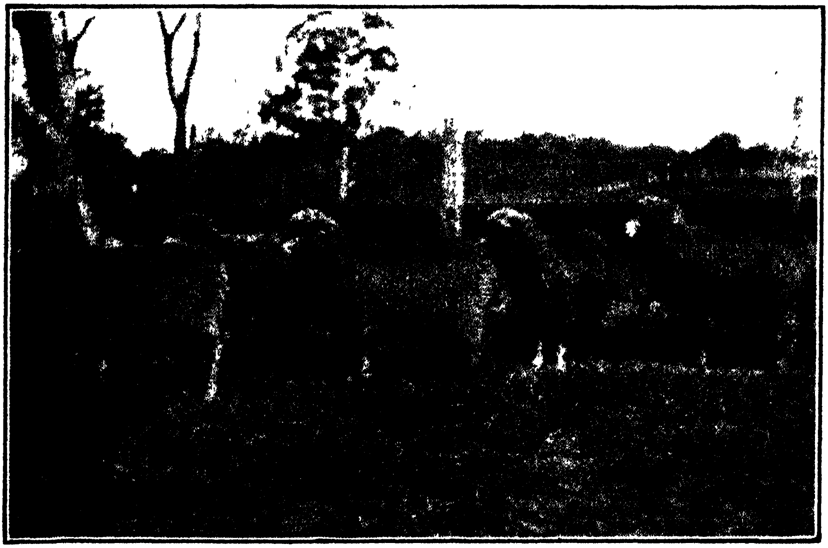
* "Labor & Industry in Australia," by Coghlan, Vol. 1.

† "Early Records of the Macarthurs of Camden."

improvement of his mixed flock. Thus came into being the first stud flock (in this case a Merino stud) in Australia, and Macarthur became the first stud master in Australia. There is some doubt as to whether he secured from Waterhouse four ewes and three rams or five ewes and three rams. In view of the small number landed it was probably the former.



The Lineal Descendants of the first Australian Merino Stud Flocks.
(Reproduced from "Early Records of the Macarthurs of Camden" By courtesy of Miss Sibella Macarthur Onslow.)

*In 1905 there were added to the original Gordon Merinos and their descendants some Merinos which Macarthur, when in England, purchased at the sale of the surplus stock from the Royal Stud at Kew, which was held in 1904. These Merinos were the descendants of four rams and 36 ewes which, with the permission of the King of Spain, had been presented to the King of England by the Marchioness del Campo di Alange in 1791. These sheep had been selected from the Spanish flock known as "Negrette." Owing to the opposition of Sir Joseph Banks to Macarthur it was not without difficulty that these sheep—nine rams and one ewe—were allowed to leave England for Australia. Under an old unrepealed Act it was a felony to export sheep from England, and rendered those who were guilty of such an offence to dire penalties such as cutting off the right hand and branding the forehead. Fortunately, Macarthur was persistent and not easily deterred by obstacles which resulted from accident or design. He approached Lord Camden and obtained a special Treasury warrant by which the animals were allowed to leave. They were then shipped immediately in a vessel which Macarthur had very appropriately named "Argo."

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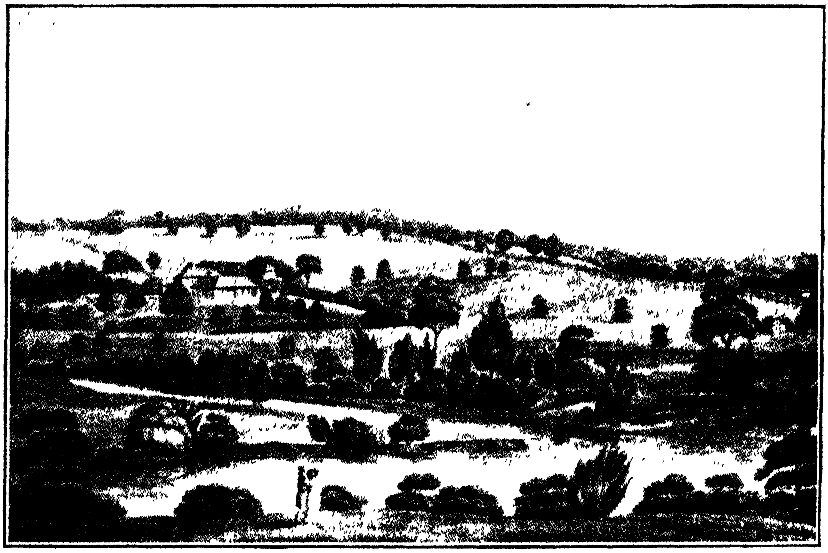
* "Early Records of the Macarthurs of Camden."

In an * account of the Kew sale given in the "Agricultural Magazine," August, 1904, reference is made to eight of the sheep purchased, and of these two were said to be suffering from temporary blindness. Apparently Macarthur was so anxious and determined to obtain Merino sheep and consummate his plans to justify his views that he purchased sheep that were not in perfect health. It is believed that three rams died on the voyage and one shortly after landing. There remained *"in a very healthy state" five rams and one ewe, which were added to the little stud flock which by now was said to have increased to sixty and his mixed flock to 5,000.

It is not known from which special Spanish flock the Gordon Merinos were descended; Sir William Macarthur, son of Captain Macarthur, stated that he understood the sheep introduced from Kew to be of somewhat different type to the originals "with more dewlap and darker fleeces on the outside," very close woolled and less fine." He also stated *"There was never any other than the blood of these lots of sheep in our stud flock."



Elizabeth Farm, Parramatta,
' The Home of the first Austialian Merino Stud Flock.
(Reproduced from "Early Records of the Macarthurs of Camden." By courtesy of Miss Sibella Macarthur Onslow.)

The stud flock was kept at "Elizabeth Farm" (named after his wife) until 1820, when it was transferred to Camden Park. At its maximum the stud contained about 400 ewes of the first class and about 500 of the second class. Its subsequent history, stated by Coghlan, was—* "It was preserved at Camden Park for many years, until sheep-breeders from Victoria offered very good prices for it, and Macarthur's sons, who found that for some obscure reason the soil of the Cow pastures was not as suitable for sheep as it had been, decided to sell. Accordingly, the flock was dispersed in 1858. The value of the breed was fully recognised, and was not allowed to deteriorate. Years afterwards, William Campbell, into whose hands some of these sheep had fallen, sent a number of pure ewes and a ram to Sir William Macarthur at Camden Park, and there a small flock is still preserved in its original purity, and it is curious that it does not seem to have suffered from its prolonged in-breeding."

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* "Early Records of the Macarthurs of Camden."

The foundation of the "Macarthur" stud was therefore of extreme importance, because of the influence it has had upon the building up of the pastoral industry of the Commonwealth, which to-day is the greatest of all our primary industries, and which has been the forerunner of our agricultural industry. How valuable these industries have proved may be gauged from a comparison of the wealth produced by them in 1925-26 with the total wealth produced in the Commonwealth; in that year the total production from all industries—Pastoral, Agricultural (including Dairying), Forestry, Mining, Fisheries and Manufacturing—was £430,387,000, that from the Allied Pastoral and Agricultural industries was 58 per cent. of this, viz., £249,755,000, and from the Pastoral industry alone £113,327,000, or 26 per cent.

To John Macarthur is to be given the credit of establishing the first Merino stud in Australia, and thus laying-in the foundations of the Australian wool industry, but in this honour his wife, Elizabeth Macarthur, must be associated with him. His wife had charge of his affairs, including the care and management of his flocks, during periods extending over at least 13 years. In consequence she had much, and probably most, to do with the building up of the little stud and the improvement of his larger mixed flock. The supervision and care of these sheep were entirely in her hands during his absence in England from 1801 to 1805, and later during the longer and more anxious period of his exile in England from 1809 to 1817, consequent upon the part he took in connection with the deposition of Governor Bligh. The successful development of the little stud was due, in no small measure, to the personal care and attention which she must have given to it during these periods, and especially in the early and critical years when so little was known by anyone in the colony regarding sheep husbandry.

Mrs. Macarthur was the first educated woman to come to Australia; her correspondence shows how worthily she upheld the best traditions of the British gentlewoman, and moreover how great an interest she took in her husband's affairs, and how readily and cheerfully she adapted herself to new and unfamiliar surroundings; she thus commenced to establish what is now the recognised reputation of the Australian countrywoman, and proved to be the worthy forerunner of that band of Australian pioneer women of whom all Australians have reason to be proud.

The part which the pastoral industry has taken in the development of Australia, the great wealth it has produced and is still producing, and the proud position which Australia holds to-day amongst the wool producing countries of the world, supply unassailable evidence that the idea of Macarthur of producing fine wool in Australia, then represented by New South Wales, was a sound one. Each succeeding year as it speeds on will, if it be needed, emphasise this. So tremendously fruitful has the idea proved that in the annals of Australia the year which gave it birth—probably 1795—should be regarded as second only in importance to that, seven years previously, in which Governor Philip laid the foundations of this Commonwealth of ours.

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* "Labour and Industry in Australia," Vol. 1.

Mrs. John Macarthur,
who shares with her husband the credit of establishing the Australian Merino wool industry.

(Reproduced from "Early Records of the Macarthurs of Camden." By courtesy of Miss Sibella Macarthur Onslow.)

The beginning made by Macarthur to develop his idea was a very modest one. The original animals in his stud numbered no more than eight, and probably only six, to which eight years later another six were added. Its establishment in this humble way was, however, of the greatest import. The rams from the stud and the ewes from the improved flocks, as the result of using only Merino rams in it, were distributed far and wide over the Commonwealth (including Tasmania). The result has been that in starting his stud with good sheep, and maintaining their purity as the result of freedom from outside introductions, with its corollary inbreeding, Macarthur laid the foundation from which the Australian Merino, as we know it to-day, has been built up. Subsequent events have proved this to be not only of Australian but of international moment. At that time Spain, amongst the nations, was alone in her glory as a producer of fine wool. She was, however, at the zenith of her fame, for a few years later the Peninsular war was to prove responsible for the reduction in the numbers of many, if not all, of her famous flocks, including the confiscation and destruction of some of them, and thus, like the Phoenix of old, from the ashes of the departed glory of the Spanish Merino the Australian Merino has arisen, by reason of its vaster numbers, to greater fame.

CRAB GRASS.

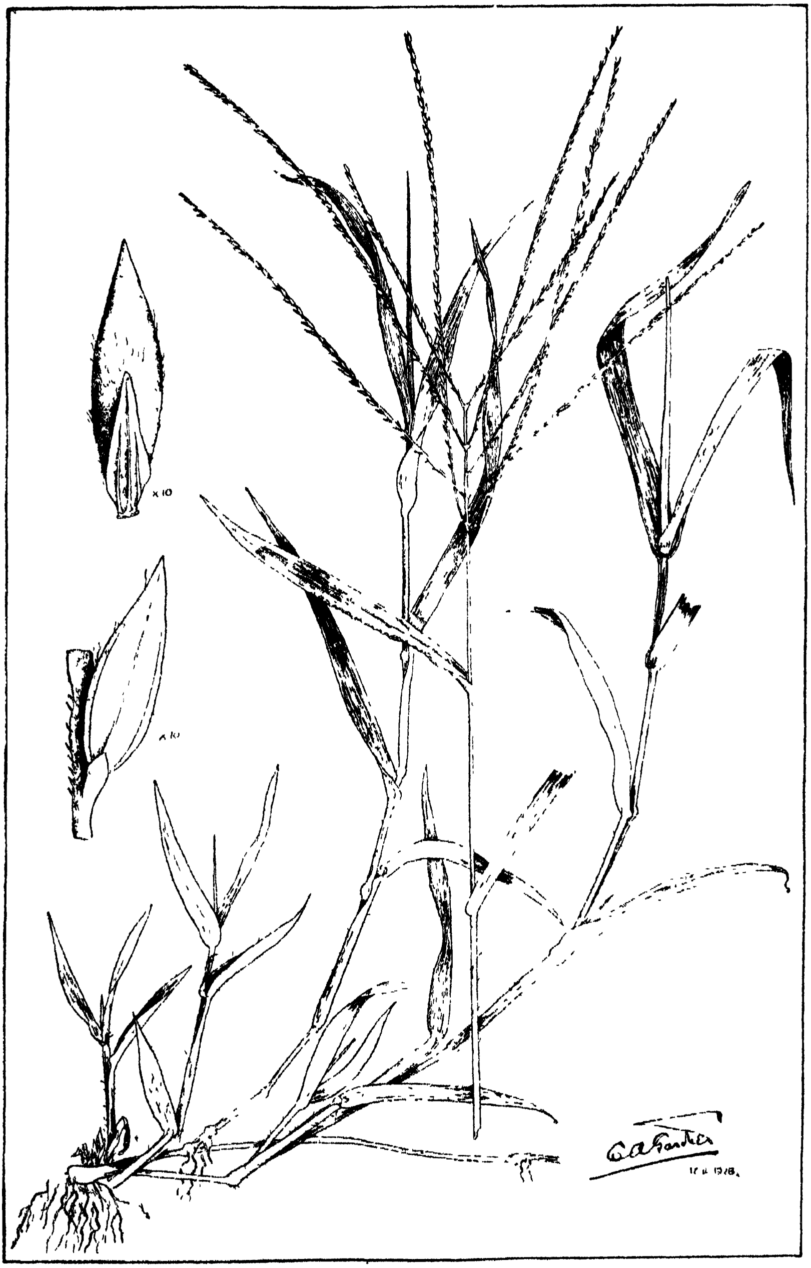
(*Digitaria marginata*, Link.)

W. M. CARNE, F.L.S., and C. A. GARDNER.

This grass, also known as Summer Grass, is most common as a weed of orchards, lawns, gardens and other cultivated areas, and occurs to some extent as a pasture plant in the winter swampy areas of the western coastal plain. Where stock have access to the grass during the summer they thrive upon it. The plant, however, is an annual, limited to summer growth, commencing to germinate during the early summer months and dying out with the advent of winter. If the plants are allowed to seed they reappear the following summer, the seed production being remarkably free.

Crab grass makes a very vigorous growth and is not particular as to soils, provided that it receives sufficient moisture in the early growing season. Although useful as a pasture plant it cannot be regarded as equal to Paspalum or Couch, which will usually thrive where Crab grass succeeds.

Where the grass proves a weed, care should be taken to prevent it flowering by pulling out the plants when young. It is necessary to pull the plant out by the roots, as the smallest piece of stem remaining in the soil grows again with surprising rapidity. Pulling the grass out of lawns is often a difficult process, since the runners become entangled in the lawn grass. If pulling is not resorted to the grass should be kept well mown to prevent flowering. When applying top dressing to a lawn clean sand should be used, since the grass is frequently introduced into lawns during this operation.



Crab Grass.

(*Digitaria marginata.*)

Showing habit of plant and details of spikelet.

Sand obtained from untouched land at a depth of over eighteen inches should be free from weed seeds. The danger of introducing other lawn weeds is almost inevitable if surface sand is used for top dressing.

Description of Plant.—An annual grass with stems usually creeping and rooting; leaves usually sprinkled with hairs, the ligule short and jagged; spikes digitate (finger-like) or approximate at the summit of the stem, 3-10 in number, slender and straight, 2-6 inches long; spikelets in pairs on unequal pedicels about 3 mm. long, acuminate, glabrous or pubescent, the lowest glume minute, the second three-nerved, half as long as the third which has smooth nerves.

A closely allied species (*D. sanguinalis,* Linn.) Scop., differs from D. *marginata* in very minute details which are scarcely of a specific character. The two plants are usually known under the common name of *Panicum sanguinale.*

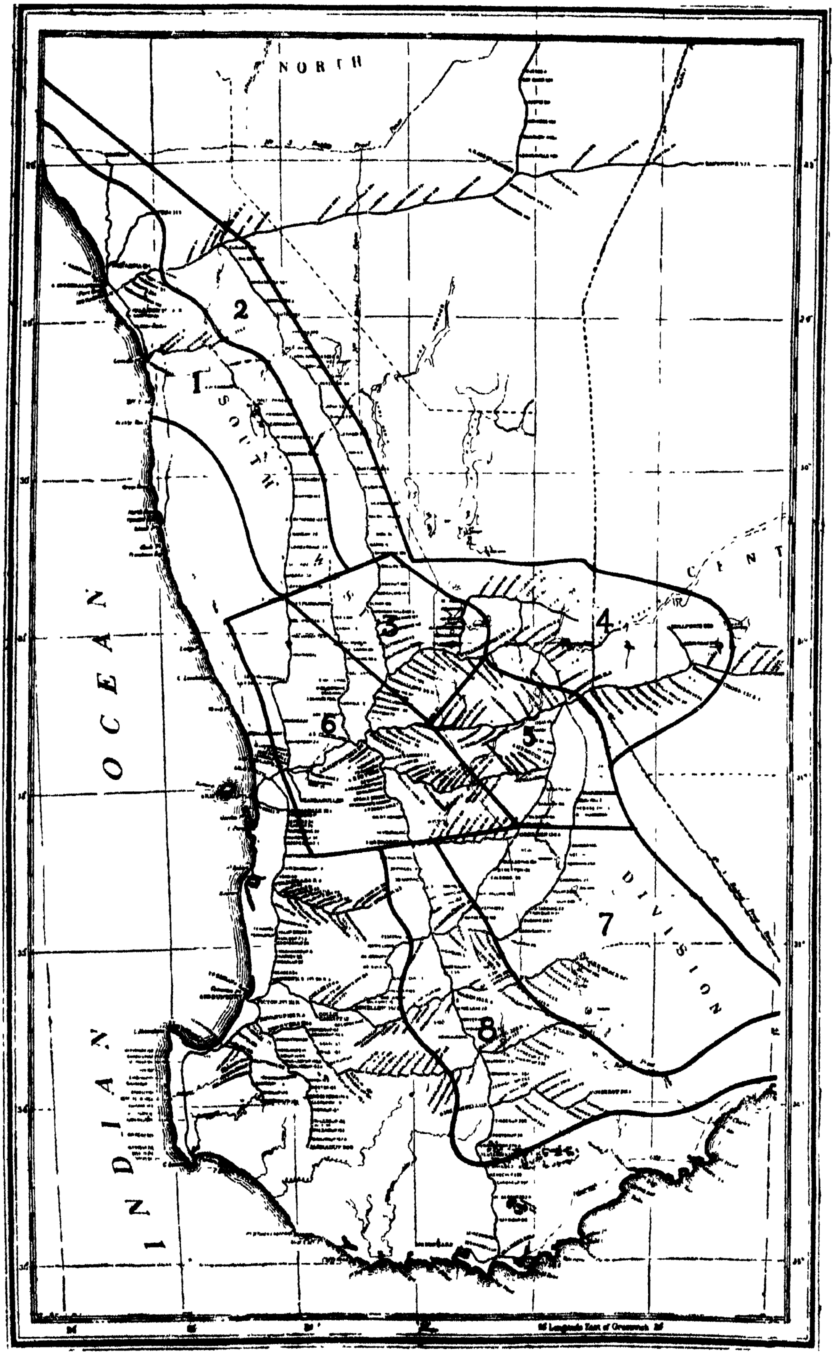
THE "ROYAL" AND DISTRICT AGRICULTURAL SOCIETIES' CROP COMPETITIONS.

I. THOMAS,
Superintendent of Wheat Farms.

The Royal Agricultural Society has promoted, during the past five years, competitions for wheat crops of not less than 50 acres of any one variety amongst the district Agricultural Societies in each of the eight zones into which the Wheat Belt has been divided for the purpose of these competitions. In each of the eight zones a championship prize is awarded for the best crop, also a second prize is awarded for the runner up, those eligible for these prizes being the first and second prize winners of the competitions held by the district Agricultural Societies, provided they are held in accordance with the conditions laid down by the Royal Agricultural Society. These conditions require that the crop shall be grown on fallowed land, shall not be less than 50 acres in area of one variety and shall be judged according to the following scale of points:—

Yield	40
Freedom from weeds	20
Freedom from disease	15
Freedom from admixture	15
Evenness of growth	10
Total	100

The judges of the Royal Crop Competitions since their inception have been departmental officers attached to the Wheat Branch, and the same officers have also judged the majority of the district competitions. As it is obviously desirable that all the crops in any one zone should be inspected and the awards for the championship prizes made by the same judge, and as it is the definite and strong wish of many district societies that departmental


NORTH
SOUTH
CENT
DIVISION
INDIAN OCEAN
1
2
3
4
5
6
7
8
Longitude East of Greenwich

officers should continue to judge their competitions, the zones are arranged so that the societies which are adjacent to each other and which have similar interests and climatic conditions, are grouped together. This requires the Wheat Belt to be divided into eight zones.

The eight zones into which the Wheat Belt is divided for the purpose of the competitions are as shown on the accompanying map.

In some districts the Agricultural Societies make no provision for crop competitions, and in order to prevent farmers who live in such districts being debarred from competing for the championship prize in their zones, the Royal Agricultural Society permits such farmers to enter for the competition directly through that Society.

The reports and awards made by the respective judges in the different zones are hereunder. The points awarded for yield are not based upon the estimated yield, but upon that calculated from portions of the crop obtained from small areas taken systematically throughout the crop. These portions of the crop are threshed and the grain weighed.

ZONES 1 AND 2.

Judge: F. L. SHIER, B.Sc. (Agric.), Agricultural Adviser.

ZONE 1.

The competitors in this zone numbered six, all of which entered directly with the Royal Agricultural Society. When one considers that this zone embraces the Geraldton, Northampton, Yuna, and the districts on the Midland Railway line as far South as Moora, the number of entrants is most disappointing. This is probably due to the fact that no local Society competition is held to stimulate local interest. This is to be regretted, as the lands in these districts, combined with the climatic conditions, are capable of producing crops equal to any in the State.

The points awarded to the various competitors are shown in the table hereunder:—

TABLE 1.
ROYAL AGRICULTURAL SOCIETY
ZONE 1.
Judge: F. L. Shier—Agricultural Adviser.

Competitor	District.	Variety.	Yield. 40 points.	Freedom from weeds. 20 points	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points.	Evenness of Growth. 10 points.	Total. 100 points.
Bothe, B. D. ...	Coorow ...	Nabawa ..	39	15	13	14	9	90
Hebiton, J. K.	Three Springs...	Merredin ...	30	17	13	14	8	82
Morcombe, P. T.	Coorow ...	Nabawa ...	27	18	14	14	8	81
Padbury, Wm....	Three Springs. .	Nabawa ...	23	19	14	13	9	78
Carter, R. and Sons	Three Springs...	Nabawa ..	25	18	13	13	8	77
Cuming Bros. ...	Carnamah ...	Yandilla King	24	18	13	13	8	76

The winning crop, that of Mr. Baxter D. Bothe, Nabawa variety, was indeed a splendid one and was calculated to yield 39 bushels per acre. It was a little on the tall side as is typical of most crops of this variety in the wetter districts, and very heavily stooled. The heads were long and well filled, having in most cases three grains across the middle spikelets. Being old land it contained small quantities of wild oats, canary grass and cockspur.

Practically no strange heads were to be found, and except for a trace of Takeall in one corner it was very free from disease. Mr. Bothe is to be congratulated on this entry as it is indeed one of the finest crops that has yet been produced in this State.

The second prize winning crop was of the Merredin variety, and was calculated to yield 30 bushels per acre, which is a very fine yield for an early variety. It was more free from weeds than the winning crop, but slightly uneven in height. No admixture was to be found, and except for a trace of loose smut it was free of disease.

Details of the methods of cultivation adopted by the various competitors are shown in the table hereunder for comparison purposes:—

TABLE 2.

Zone 1.—1927.

	B. D. Bothe.	J. K. Hebiton.	R Clarke and Sons.	Wm. Padbury.	P. T. Morcombe.	Cuming Bros.
Years cropped	11	6	15	..	4—1st fallow	10—1st fallow
Timber .	Salmon Gum	York Gum and Jam	Titree, York Gum and Salmon	York Gum, Jam, and Salmon	Salmon and Gimlet	Kerosene bush and stunted Jam
Ploughed	Disc, July	Mouldboard, Aug	Mouldboard, July	Disc. ploughed late Oct.	Disc ploughed, June, July	Mouldboard, June
Depth ..	4in.	4in.	4in.	3in.	3½in.	4in
Other Cultivation	Tandem disced Sept. and March	Harrowed after plough, disced April	Reploughed once mould, and once sundercut before Oct. Cultivated prior to drilling	Springtyned before seeding	Springtyned Sept, Oct, and again April	Springtyned August
Variety ..	Nabawa	Merredin	Nabawa	Nabawa	Nabawa	Yandilla King
Planted ..	Combined mid. May	Disc. drilled 3rd wk. May	Combined mid. May	Combined mid. May	Disc. drilled, mid. May	Disc drilled mid. April
Rate ...	60	50	60	60	52	45
Graded ...	Yes	Yes	Re-cleaned	Yes	No	Yes
Treated ...	Dry	Dry	Dry	Dry	Dry	Dry
Super. ...	98	112	65	83	90	175
Disease ...	Trace Takeall in one corner	Trace loose smut	Trace flag rust		Fed off 3 wks. in July	Stem rust

It is significant to note that all of the competitors used the dry copper carbonate treatment for the prevention of Ball Smut and Bunt and that in no instance was this disease to be found in any of the competition crops.

The official rainfall as recorded at Carnamah, Three Springs and Coorow is also shown:—

—	Jan.	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct	Total.			
Carnamah	...	...	512	35	115	297	409	175	206	15	1,217	...	61	1,825
Three Springs	...	18	417	29	148	300	341	163	184	24	1,160	5	121	1,750
Coorow ...	...	...	371	47	115	362	337	221	142	21	1,198	...	...	1,616

ZONE 2.

Dalwallinu Agricultural Society.

Of the sixteen entries received by the Society, ten remained for final inspection. The entry of Mr. H. E. Hamling, which was submitted, was deemed ineligible under the conditions of the Royal Agricultural Society whereby all competition areas must be on fallow.

The points awarded to the various competitors are shown in the table hereunder:—

TABLE 3.
DALWALLINU AGRICULTURAL SOCIETY.
ZONE 2.

Competitor.	District.	Variety.	Yield. 40 points.	Freedom from weeds. 20 points.	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points.	Evenness of Growth. 10 points.	Total. 100 points.
Martin, K. J. ..	Dalwallinu ...	Ford ...	30	18	14	11	8	81
Harris, Wm ...	Dalwallinu ..	Nabawa ..	26	16	13	14	8	77
Bradford Bros	Damboring ...	Gluyas Early	23	18	13	14	8	76
Bonney, A. .	Pithara ...	Nabawa ...	21	18	14	14	8	75
Court, A. H. .	Courtlea ...	Nabawa ...	22	18	13	14	7	74
Jones, A. T. ...	Pithara	Gluyas Early	25	16	14	10	9	74
Harris, A. J., jr	Dalwallinu .	Merredin ..	23	16	13	12	8	72
Harris, R. W. O.	Dalwallinu ...	Nabawa .	21	17	11	14	8	71
Swincer, W. R.	Pithara ..	Golden King	17	16	9	12	9	63
Harris, A. J., snr.	Dalwallinu ..	Gresley .	16	14	13	11	7	61

The district suffered a dry spell during late August and early September, which had a considerable effect on the crops, particularly those grown on land which had little or no surplus moisture conserved from the previous year by good fallow.

The official rainfall as recorded at Dalwallinu for 1927 is:—

—	Jan	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total for year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Dalwallinu	39	...	361	60	82	282	300	134	62	44	904	13	...	1,377

A noticeable feature in this district is the general absence of sheep, only three of the competitors using them to any extent. This is to be deplored, particularly in a district where the majority of the farmers are well established. The benefits of sheep on the wheat farm have been stressed continuously. They keep the fallows clean of weeds, which not only rob the soil of moisture, but in many instances form host plants to harbour diseases over to the next wheat crop; for example, Barley Grass and Take-all. Sheep also compact the soil, which is no small factor in the preparation of a good seed bed for a wheat crop. This is a condition which is very hard to obtain in Morrell type soils, which are fairly plentiful around Dalwallinu. In fact, many fallows have been ruined by too frequent cultivations for the destruction of weeds during the summer months when the soil is in a dry state.

Without sheep, stubble generally becomes a hindrance to farming operations in the drier areas. It keeps the soil too open and allows valuable moisture to escape, and, above all, prevents the consolidation of the sub-surface soil, one of the essential factors for the success of fallow. With sheep, the stubble is more easily changed to humus, thereby improving the physical condition of the soil and greatly adding to the nitrogen supply to the plant.

Sheep, in addition to being beneficial to the fallowed land, also increase the annual monetary return of the farmer, and with two sources of income a failure in one does not mean a failure altogether.

Six of the competitors treated their seed by the dry method for the prevention of Ball Smut, while three planted seed from a clean crop, the seed of which had been dry treated the previous year. Where clean crops are being obtained, this practice of treating the seed every alternate year is quite satisfactory. One competitor used the wet method, but ball smut was found in large quantities. Evidently the treatment was not carried out correctly, as this method, although not so convenient or easy as the dry copper carbonate has proved its efficiency beyond dispute.

The winning crop of Mr. K. J. Martin was of the variety "Ford," and was calculated to yield 30 bushels per acre. It was well stooled and of a nice stripping height. It was very free from disease and the only weeds were a little wild oats and cockspur. However, far too many strange heads were present. Sheep were pastured on the fallow and before ploughing. This to a great extent was, no doubt, one of the factors in the production of this high yielding crop on Morrell and Salmon Gum land, which was free from weeds and had previously produced ten crops.

The crop gaining second prize was of the Nabawa variety and was calculated to yield 26 bushels per acre. It was of a nice height and evenly stooled. Very few strange heads were present but there was a fair percentage of Mustard, Barley Grass, Wild Oats and Cockspur Flag Rust was the only disease noticed.

Below is a table showing details of the methods employed by the various competitors:—

TABLE 4.—DALWALLINU DISTRICT CROP COMPETITION.—ZONE 2..

——	Martin, K. J.	Harris, W. M	Bradford Bros.	Bonney, A.	Court, A H
Years cropped	10 Sheep on fallow and before plough	6	6, 2 fallows, sheep pastured	7, first fallow	4th, 2 fallows
Timber ...	Salmon and Morrell	Salmon and Gimlet	Salmon and Morrell	Salmon, Jam and Gimlet	Morrell, principally Salmon, Gimlet, and Ti-tree
Ploughed ...	Mid. June	Mouldboard, July	Disc, July	Mouldboard, early July	Mouldboard, early July
Depth ..	4in.	4in.	4in.	4in.	4½in.
Other cultivations	Springtyned, Sept., harrowed and cultivated March	Springtyned, Sept., Feb. and March	Sundercut, Sept. and April	Springtyned, Sept., sundercut March	Springtyned, Oct. Harrowed March
Variety ...	Ford	Nabawa	Gluyas Early	Nabawa	Nabawa
Planted ...	Combine, 3rd week April	Combine, mid. May	Combine, 1st week May	Disc. Drilled 1st week May	Disc drilled 1st week May
Rate	50lbs.	48lbs.	55lbs.	45lbs.	60lbs.
Graded ...	Yes	Yes	Yes	Yes	Recleaned
Treated ...	Dry	No. Dry previous year	Dry	Dry	Dry
Super. ...	60lbs.	90lbs.	90lbs.	100lbs.	34lbs.*
Disease ...	. .	Trace Flag Rust	...	. .	...

* Error in cogs.

DALWALLINU DISTRICT CROP COMPETITION—*continued.*

—	Jones, A. T.	Harris, A. J., Jnr.	Harris, R. W. O.	Swincer, W. R.	Harris, A. J., Snr.
Years cropped	12	4. 2 fallows. No. sheep	5 crops, 2 or 3 fallows, no sheep	6. No sheep	12. No sheep
Timber ...	Salmon, Gimlet and Ti-tree	Salmon, Gimet, Jam, York Gum	Salmon, Gimlet	Salmon and Gimlet	Gimlet, Salmon and Morrell
Ploughed ...	Disc., July	Mouldboard, July and Aug.	Mouldboard, July	Disc., end July	Disc., July and August
Depth . .	4in.	4in.	4in.	3½in.	4in.
Other cultivations	Disced Sept. Springtooth Oct., and again before seeding	Sundercut Nov. Springtyne March	Springtyned, Sept., Oct., Mar., and before seeding	Worked three times Springtyne	Sundercut Oct. and before seeding
Variety ...	Gluyas Early	Merredin	Nabawa	Golden King	Gresley
Planted ...	Disc. drilled mid. May	Combine end of May	Combine mid. May	Disc drilled mid. May	Disc drilled mid. May
Rate	60lbs.	57lbs.	55lbs.	45lbs.	58lbs.
Graded . .	Recleaned	Yes	Recleaned	No	Yes
Treated	Dry	Dry	No. Previous year	Wet	No. Previous year
Super. ...	75lbs.	70lbs.	70lbs.	60lbs.	80lbs.
Disease ...		Loose Smut	Takeall and loose smut	Ball smut and Flag Smut bad, some Takeall	Stem rust and loose smut

ZONE 3.

Judge: J. Langfield, Manager, Merredin Experiment Farm.

Entries for this zone were received from the Dowerin, Wongan Hills, and Wyalkatchem Agricultural Societies.

Dowerin Agricultural Society.

In the Dowerin Agricultural Society's competition, seven competitors submitted crops for inspection.

The points awarded are set out hereunder:—

TABLE 5.
DOWERIN AGRICULTURAL SOCIETY.
Judge: J. H. Langfield—Manager, Merredin Experiment Farm.

Competitor.	District.	Variety.	Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points.	Total, 100 points.
Bear, H. E. ...	Minnivale ...	Gluyas Early	28	18	14	13	9	82
Cosh, E. C. ...	Minnivale ...	Gluyas Early	26	19	14	14	8	81
Hughes, J. R. ...	Minnivale ...	Nabawa ...	26	18	14	14	8	80
Riley, R. R. ...	Minnivale ...	Merredin . .	28	17	13	13	8	79
Jones, A. ...	Dowerin ...	Nabawa ..	25	17	14	14	8	78
Harris, W. V. ...	Minnivale ...	Nabawa ...	22	19	14	14	8	77
O'Loughlin, M. J.	Minnivale ...	Merredin ...	20	17	12	14	8	71

The winning crop—that of Mr. H. E. Bear—was planted with the variety Gluyas Early during the third week in May at the rate of 50lbs. of recleaned seed per acre. Superphosphate was applied at the rate of 80lbs. per acre. This crop was closely followed by several, all giving promise of fair yields.

A little flag smut was noticed, and on two crops ball smut had appeared. Odd patches of take-all were also found. Taken generally, the crops were comparatively free of weed growth and admixture.

The rainfall, as officially recorded at Dowerin, was:—

—	Jan.	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total. for year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Dowerin	...	7	425	28	119	297	260	144	97	104	1,021	60	8	1,549

The details of the cropping are as hereunder:—

TABLE 6.

DOWERIN DISTRICT CROP COMPETITION

ZONE 3.

Competitor.	H. E. Bear	Cosh, E. C.	Hughes, J. R.	Riley, R.P.
Years cropped ..	14	17	6	17
Timber ...	Salmon Gum	Salmon and Gimlet	Gimlet and Salmon	Gimlet and Salmon
Ploughed	July	July	July	June
Depth ..	4in	4in.	4in.	4in.
Condition	Good	Good	Good	Good
Cultivations	Sundercut Sept., and then harrowed Cultivated in March, and sown with Combine	Skim ploughed and Springtoothed in Spring Cultivated. Springtoothed and then sown by Combine	Sundercut in Spring, again April and sown with Combine	Cultivated Sept., again Mar. with Sundercut. Cultivated. Springtyne and sown with Combine
Variety .	Gluyas Early	Gluyas Early	Nabawa	Merredin
Pickled	Dry	Dry	Dry	Dry
Date Planted .	3rd week May	10th May	Mid. May	22nd May
Seed per acre ..	50lbs.	45lbs.	50lbs.	48lbs
Graded ...	Winnowed	Winnowed	Yes	Yes
Rate of Super. .	80lbs.	100lbs	100lbs.	90lbs.

Competitor.	Jones, A.	Harris, W. V.	O'Loughlin, M. J.
Years cropped ...	15	2	17
Timber	Salmon and Gimlet	Scrub Plain	Gimlet and Salmon
Ploughed	July	October	July
Depth	4in.	4in.	3in.
Condition	Good	Dry	Hard
Cultivations ..	Cultivated in Spring and before seeding sown with Combine	Sundercut before drill	Cultivated in Spring and disced before seeding sown with Combine
Variety	Nabawa	Nabawa	Merredin
Pickled	Dry	Dry	Wet
Date Planted ...	Mid. May	20th April	1st June
Seed per acre ..	45lbs.	50lbs.	70lbs.
Graded	Yes	Winnowed	Winnowed
Rate of Super. ...	140lbs.	112lbs.	90lbs.

Wyalkatchem Agricultural Society.

Of the nineteen entries in the competition of the above Society five were withdrawn. It is to be regretted that no notifications were received until the farms were visited, as much unnecessary travelling could have been avoided. The points awarded are set out in the table hereunder:—

TABLE 7.
WYALKATCHEM AGRICULTURAL SOCIETY.
ZONE 3.
Judge . J. H. LANGFIELD—Manager, Experiment Farm, Merredin.

Competitor.	District.	Variety.	Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points.	Total, 100 points.
Threlfall, C.	Korrelocking	Nabawa	34	19	14	14	9	90
Ferries, H. G.	Wyalkatchem	Nabawa	32	19	14	13	8	86
Lindsay, J.	Wyalkatchem	Nabawa	31	18	14	14	8	85
Payne, Mrs.	Korrelocking	Merredin	31	18	14	13	8	84
Lehman, C. E.	Wyalkatchem	Nabawa	28	18	14	13	8	81
Smith, P. H.	Yorkrakine	Gluyas Early	28	18	13	13	8	80
Jones, W. W.	Cowcowing	Nabawa	26	19	14	12	8	79
Riches, G.	Wyalkatchem	Nabawa	26	18	13	14	8	79
Davies, W. H.	Yorkrakine	Nabawa	26	18	14	14	7	79
Diver, T. E.	Yorkrakine	Nabawa	26	17	12	13	8	76
Bowles, J.	Wyalkatchem	Nabawa	25	16	13	14	7	75
Vernon, Mrs. M.	Korrelocking	Gresley	24	17	13	12	8	74
Hall, L.	Cowcowing	Nabawa	24	15	14	13	7	73
O'Loughlin, M. J.	Minnivale	Merredin	20	17	12	14	8	71

The winning crop was part of 70 acres of the variety Nabawa. It was very attractive in appearance, being even in height with little or no weeds, admixture, or disease.

Following the winning crop, that of Mr. G. Threlfall, there were several excellent crops, there being very little difference in the awards made. Those of Messrs. H. G. Ferries and J. Lindsay and Mrs. Payne were all of a high standard. Most of the remaining crops, as indicated by the awards, although not so good were also creditable.

Of the fourteen crops inspected, ten were of the variety Nabawa, two Merredin, and one each of Gluyas Early and Gresley. It is noteworthy that whereas twelve of the fourteen competitors used the dry and two the wet method when treating their seed for the prevention of the disease smut, the only ball smut found was in one of the crops sown with wet pickled seed. Both methods are so reliable that the presence of disease in this case cannot be due to the method of treatment but rather to the manner in which it is applied.

Small patches of take-all were also found in most of the crops. Flag smut was noticed in the varieties Gluyas Early, Gresley, and Merredin.

The rainfall, as officially recorded at Wyalkatchem, Korrelocking and Cowcowing, was:—

——	Jan	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total for year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Wyalkatchem	6	12	596	28	99	220	210	106	175	87	897	41	23	1,608
Korrelocking	...	72	609	28	80	194	215	114	118	94	815	26	7	1,49
Cowcowing	...	...	671	13	87	210	212	107	113	95	824	3	10	1,52

The cropping details are set out in the table hereunder:—

TABLE 8.

WYALKATCHEM DISTRICT CROP COMPETITION.

ZONE 3.

Competitor.	Threlfall, G.	Ferries, H. G.	Lindsay, J.	Payne, Mrs.	Lehman, C. E.
Years cropped	18	17	...	20	15
Timber ...	Salmon, Gimlet and Mallee	Gimlet	...	Gimlet and Salmon	Gimlet, Mallee, and a bit of Morrell
Ploughed ...	Early June	June	...	June	June
Depth ...	4in.	3½in	..	3in. and 4in.	4in.
Condition ..	Good	Good	...	Good	Good
Cultivations ...	Springtyne in July, Duckfoot in Oct. 3 times in March sown with Combine	Sundercut Sep. Again in Oct., again in Mar. sown with Disc Drill	..	Cultivated Sept. and sown with Combine	Cultivated Aug. and harrowed. Cultivated and harrowed before sowing. Sown with Combine
Variety ..	Nabawa	Nabawa	Nabawa	Merredin	Nabawa
Pickled ..	Dry	Dry	..	Dry	Dry
Date planted ..	1st week May	End of April	.	1st week May	Mid. May
Rate of Seed	45lbs.	50lbs.	.	60lbs.	47lbs.
Graded ...	Yes	Yes	.	Yes	Yes
Rate of Super.	90lbs.	90lbs.	.	90lbs	70lbs

Competitor.	Smith, P. H.	Jones, W. W.	Riches, G	Davies, W. H.	Diver, T. E.
Years cropped	5	3	10	Part 12 years; part 3 years	4
Timber ...	Salmon, Mallee and Morrell	Gimlet and Salmon	Gimlet and Salmon	Gimlet and Mallee	Gimlet
Ploughed ..	August	August	End June and early July	July	August
Depth ...	4in.	3in. to 4in.	3in. to 4in.	3½in. to 4in.	4in.
Condition ...	Good	Good	Good	Good	Hard
Cultivations ...	In Sept., then after March rain, Sundercut and sown with Combine	Cultivated and drilled	Sundercut Spring, sundercut and skim in Autumn. sundercut and sown with disc drill	Sundercut Sep. sundercut before seeding and sown with Combine	Suntyned and harrowed and sown with Combine
Variety ...	Gluyas Early	Nabawa	Nabawa	Nabawa	Nabawa
Pickled ...	Dry	Dry	Dry	Dry	Dry
Date planted	2nd week May	Mid. April	Early May	1st week May	3rd week May
Rate of Seed	64lbs.	45lbs.	43lbs.	54lbs.	50lbs.
Graded ...	Yes	Yes	Yes	Winnowed	Winnowed
Rate of Super.	60lbs.	70lbs.	90lbs.	90lbs.	60lbs.

WYALKATCHEM DISTRICT CROP COMPETITION—*continued.*

ZONE 3.

Competitor.	Bowles, J.	Vernon, Mrs.	Hall, L.	O'Loughlin, M. J.
Years cropped	16	14	16	17
Timber ...	Gimlet, Salmon and Mallee	Gimlet and Salmon	Gimlet and Salmon	Gimlet and Salmon
Ploughed ...	July	September	June to August	July
Depth ..	4in.	4in.	6in.	3in.
Condit ...	Half good, balance dry	Good	Good	Hard
Cultivations ...	Cultivated Spring and twice in Autumn. Sown with Combine	Cultivated in April Sown with Combine	Sundercut Sept. again before planting	Cultivated in Spring Disced before seeding. Sown with Combine
Variety ..	Nabawa	Gresley	Nabawa	Merredin
Pickled ...	Wet	Dry	Dry	Wet
Date planted	2nd week May	Mid. May	End of April	1st week June
Rate of Seed	60lbs.	58lbs	45lbs	70lbs.
Graded ...	Yes	Yes	Yes	Winnowed
Rate of Super.	90lbs.	90lbs.	75lbs	90lbs

Wongan Hills Agricultural Society.

Of the five entries in this Society's competition, two were withdrawn. The points awarded are as hereunder:—

TABLE 9.

WONGAN HILLS AGRICULTURAL SOCIETY

ZONE 3.

Judge J H. LANGFIELD—Manager, Merredin Experiment Farm.

Competitor.	District.	Variety.	Yield 40 points	Freedom from weeds. 20 points.	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points.	Evenness of Growth 10 points.	Total. 100 points.
Parker, A. E. ..	Wongan Hills...	Nabawa ..	30	17	14	14	8	83
Ackland, J. H.	Wongan Hills...	Nabawa ..	28	17	13	14	8	80
Parker, C. E. .	Wongan Hills ..	Nabawa ...	21	17	14	14	8	74

The winning crop was 50 acres of the variety Nabawa, entered by Mr. A. E. Parker. This was sown during the end of April and the beginning of May at the rate of 52lbs. of graded seed per acre, superphosphate being applied at the rate of 83lbs. per acre. The crop was very even in height and well developed, being calculated to yield 30 bushels per acre. Little admixture was noticed.

Mr. J. H. Ackland's crop, also of the variety Nabawa, secured second place. The rate of seed sown was 55lbs. per acre, and the application of superphosphate was 112lbs. per acre. Although free from other disease, this crop had several bad patches of take-all.

The rainfall, as officially recorded at Wongan Hills, was.—

—	Jan.	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total for year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Wongan Hills	...	4	309	38	118	285	241	109	71	39	863	4	2	1,220

The details of the cropping of the competitors are as hereunder:—

TABLE 10.

Competitor	Parker, A. E.	Ackland, J. H.	Parker, C.
Years cropped ...	5	15	...
Timber	Salmon and Gimlet	Salmon, Gimlet and Ti-tree	Salmon and Gimlet
Ploughed . . .	June	July	July
Type of Plough ...	.	.	..
Depth	3in.	3½in. to 4in.	3½in. to 4in.
Condition of land at time of ploughing	Good	Good	Good
Other cultivations	Twice in Spring and once before seeding. Drilled with Combine	Sundercut and Spring-tyned in Spring. Harrowed March, then cultivated and sown with Combine	Cultivated in Spring, after March rains, and drilled with Combine
Variety	Nabawa	Nabawa	Nabawa
Planted . . .	End of April and early May	Last week April	May
Rate of Seed ...	52lbs.	55lbs.	58lbs.
Graded	Yes	Yes	Yes
Treated	Yes (dry)	Yes (dry)	Yes (dry)
Rate of Super. ...	83lbs.	112lbs.	90lbs.
Disease . .	...	...	

ZONE 5.

Judge : I. THOMAS, Superintendent of Wheat Farms.

Three District Agricultural Societies, viz., Merredin, Bruce Rock and Baandee-Doodlakine, together with two entries received direct by the Royal Agricultural Society, were represented in this zone competition.

The total number of entries received was 52, of which 14 were from Merredin, 30 from Bruce Rock, and 6 from Baandee-Doodlakine. Of the remaining two, one was from Kellerberrin and the other Tammin.

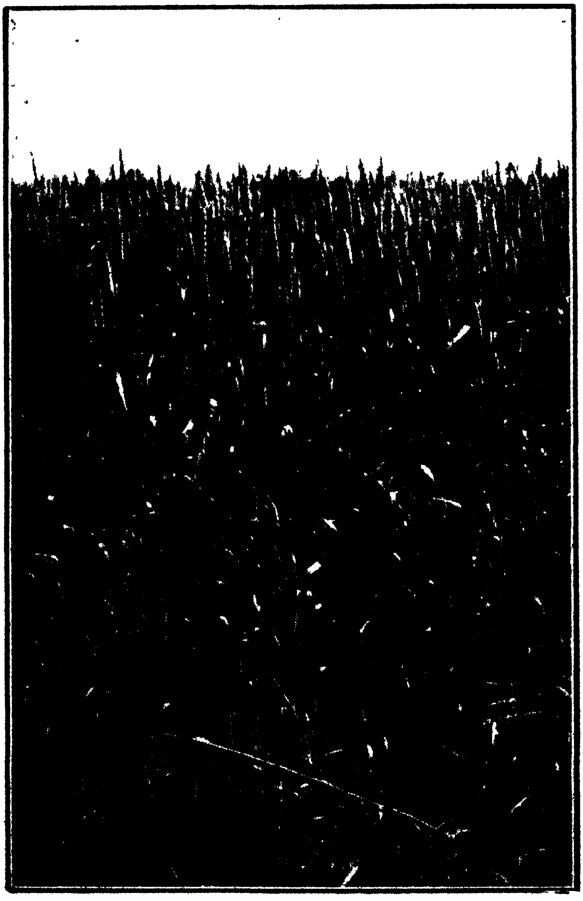
Owing to the withdrawal of 24 entries, there remained 28 for inspection. Although all withdrawals cannot, of course, be avoided, it is to be regretted that the number in this instance was so large. It was very gratifying, however, that notification, in almost every case, was received by the secretary prior to the Judge's visit. It is to be hoped that this practice will continue, thus avoiding unnecessary travelling and delay at a period when the Judge's time is so limited.

Merredin Agricultural Society.

Of 14 entries received, 11 submitted their crops for inspection. The resulting awards are set out in the table hereunder:—

TABLE 11.—MERREDIN AGRICULTURAL SOCIETY.—ZONE 5.
Judge: I. THOMAS—Superintendent of Wheat Farms.

Competitor	District.	Variety	Yield. 40 points.	Freedom from weeds. 20 points.	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points.	Evenness of Growth. 10 points.	Total. 100 points
Rowan, C. ...	Korbel... ...	Nabawa ...	34	17	13	13	8	85
Pollock, R. ...	Korbel... ..	Nabawa ...	32	17	13	13	9	84
Teasdale Bros....	Belka	Merredin ...	29	17	13	14	9	82
Dumsday, L. ...	Goomarin .	Nabawa ...	28	18	13	14	8	81
Parsons, F. ...	Korbel... ...	Nabawa ..	26	18	13	13	8	78
Teasdale, H. W.	Merredin ...	Newman's Early	26	16	13	12	9	76
Robartson Bros.	Nangeenan ..	Newman's Early	23	16	12	13	7	71
Teasdale, F. O.	Korbel... ...	Bald Early..	24	14	12	13	7	70
Clark, F. J. ...	Belka	Nabawa ..	22	15	12	13	6	68
Clothier, J. ...	Merredin ...	Newman's Early	19	16	13	13	7	68
Maughan Bros.	Nukarni ...	Nabawa ...	22	15	11	13	7	68



Clive H. Rowan's winning crop of "Nabawa."

Dumsday's competition crop, "Nabawa" (Goomarin).

R. Pollock's 50 acres (Korbel).

The winning crop was part of 190 acres of Nabawa. It was slightly irregular in stooling owing to small patches of varying soil. The heads were well filled. Very few weeds and practically no admixture were noticed, and ball smut and stem rust were present to but a slight degree. This competing crop was not so attractive as others in the competition, but nevertheless it had the appearance of being a heavy yielder.

The crop awarded second prize was also of the variety Nabawa, the major portion being the competitor's stud plot, the balance of the required area being bulk crop.

Although well grown and more regular in height and stooling, it did not have the appearance of yielding as well as the winning crop. It was fairly free from weeds and disease, of the latter only a slight infection of take-all being in evidence. The bulk crop portion contained a little barley, otherwise it was free from admixture.

One of the most attractive crops in this competition was that of Messrs. Teasdale Bros. of Belka. It was of the variety Merredin and, except for the effect of a sand drift which encroached on one side, was of very regular height and stooling, thus giving indications that thorough and uniform preparation had been given to the land.

The rainfall, as recorded at Merredin, was:—

—	Jan.	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total for year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Merredin	25	5	634	47	58	192	161	118	266	67	862	22	67	1,662

The methods of cultivation adopted by the competitors are set out hereunder:—

MERREDIN DISTRICT CROP COMPETITION.

Zone 5.

Competitor.	Rowan, C.	Pollock, R.	Teasdale Bros.	Dumsday, L.
Years cropped	5	5	At least 8	7
Timber .	Salmon, Gimlet and a little Ti-tree.	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet
Ploughed ...	June	June and July	June	July
Type of Plough	Mouldboard	Mouldboard	Mouldboard	Heavy Disc
Depth ...	3⅛in.	4½in.	3in.	3in.
Condition of land at time of ploughing	Good	Good	Good	Good
Other cultivations	Duckfoot cultivvated Aug. and Sept. and again in April and May. Harrowed behind scarifier before seeding	Crossed with Sundercut in Sept. Springtyned after rain in Feb., and again before seeding	Disced in Sept. Springtyned in Oct., in April after rain, and again prior to seeding	Broad tyne spring cultivated in Sept. and Mar. Drilled. with Combine
Variety ...	Nabawa	Nabawa	Merredin	Nabawa
Planted ...	3rd week May	2nd week May	2nd week May	3rd and 4th week in April
Rate of Seed	50lbs.	45lbs.	45lbs.	45lbs.
Graded ...	Yes	Yes	Yes	Yes
Treated ...	No	Yes (dry)	No	Yes (dry)
Rate of Super.	100lbs.	90lbs.	94lbs.	100lbs.
Disease ...	Almost free ...	Slight trace of Take-all	Flag Smut and trace of Rust	Trace of foot-rot and Rust

MERREDIN DISTRICT CROP COMPETITION—*continued.*

ZONE 5.

Competitor.	Parsons, T. G.	Teasdale, H. W.	Robartson.	Teasdale, F. O.
Years cropped	3	6	Old land	11
Timber ...	Salmon and Gimlet running to Mallee	Salmon and Gimlet	Mostly Gimlet	Gimlet
Ploughed ...	July	July	June	June
Type of Plough	Mouldboard	Disc Cultivator	Mouldboard and Disc	Mouldboard
Depth ...	4in.	3½in.	4in.	3½in.
Condition of land at time of ploughing	Good	Good	Good	Good
Other cultivations	Springtyned in Aug. Harrowed immediately after and cultivated after rain in Mar. before seeding	Springtyned in Sept. Wimmera scarifier before seeding. Combine drill with light drag harrows	Half disced immediately after ploughing and all disced again before seeding	Disced in Aug. again Sept., again Oct. Springtyned after rain in March and again in April
Variety ..	Nabawa	Newman's Early	Newman's Early	Bald Early
Planted ...	1st week in May	1st and 2nd week in May	Middle of May	1st week May
Rate of Seed	50lbs.	45lbs.	60lbs.	45lbs.
Graded ...	Yes	Yes	Yes	Yes
Treated ...	Yes (dry)	Yes (dry)	Yes (dry)	No
Rate of Super.	85lbs.	90lbs.	60lbs.	80lbs.
Disease ...	Trace Take-all and Rust.	Slight trace Rust and of Take-all	Take-all, Flag Smut and Rust	Scattered Take-all, Flag Smut and Rust

Competitor.	Clarke, F. J.	Clothier, J.	Maughan Bros.
Years cropped	5	Old land	3
Timber ..	Salmon and Gimlet	Heavy Mallee and Ti-tree	Salmon and Gimlet
Ploughed ..	July	July and August	August
Type of Plough	Mouldboard	Mouldboard and Sundercut	State Cultivating Plough
Depth ...	3½in —4in.	2½in.—4in.	3in.—4in.
Condition of land at time of ploughing	Good	Good	Inclined to bog
Other cultivations	Disc. cultivated after ploughing, again in March. Springtyned in front of the Drill	Springtyned in Sept. and March after rain. Drilled with Combine and harrowed	Cultivated in March. Drilled with Combine
Variety ...	Nabawa	Newman's Early	Nabawa
Planted ...	Middle of April	2nd week May	1st week May
Rate of Seed	45lbs.	45lbs.	45lbs.
Graded ...	No	Yes	Yes
Treated ...	Yes (dry)	Yes (dry)	No
Rate of Super.	66lbs.	90lbs.	90lbs.
Disease ...	Patches of Take-all	Traces of Flag Smut, Take-all and Rust	Bunt and trace of Rust

Bruce Rock Agricultural Society.

When entries closed for this competition, no less than 30 had been received, but owing to the subsequent withdrawal of 20, there remained 10 for inspection. The awards are given in the following table:—

TABLE 13.

BRUCE ROCK AGRICULTURAL SOCIETY.

ZONE 5.

Judge: I. THOMAS—Superintendent of Wheat Farms.

Competitor	District.	Variety	Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points	Total, 100 points.
Smith, C., & Sons	Yarding .	Gluclub ...	33	17	13	13	7	83
Johnson, W. D.	Bruce Rock	Nabawa ..	31	17	12	14	8	82
Bristow, J. W..	Ardath	Merredin .	28	17	13	13	9	80
McCarthy, P., & Sons	Eujinyn .	Gluyas Late	27	17	13	14	8	79
Harling Bros. ...	Belka .. .	Nabawa	28	17	13	12	8	78
Allen, R. M., K., and C.	Sth. Kumminin	Onas ..	27	17	13	13	7	77
Schilling, C. E and W. S.	Bungullapin .	Gluyas Early	25	17	13	12	7	74
Brown, S. A. ...	Bungullapin .	Onas ...	23	17	12	13	8	73
Wyatt, W. ..	Eujinyn .	Gluyas Early	24	16	12	13	7	72
Starcevich, J. ..	Belka	Nabawa ..	27	15	11	11	7	71

Messrs. C. Smith & Sons were awarded first prize with a crop of Gluclub. It was somewhat irregular in height and stooling, was fairly free from weeds and disease, a trace of stem rust and take-all being present. There was also a slight admixture.

This variety is one which was bred by Mr. C. Smith, senior. The competitors plant the major portion of their area under crop with it and have had considerable success.

It has a very attractive appearance, and although it grows fairly tall under favourable conditions, appears to be fairly strong in the straw. It has one serious defect in that it sheds its grain readily and therefore it is inadvisable to plant it in large areas unless a sufficient harvesting plant is available to deal with it without delay once maturity has been reached.

Mr. C. Smith is to be congratulated on his successful efforts to produce a high yielding variety and one that suits his conditions so well.

Mr. W. D. Johnson's competing crop of Nabawa was part of a field of 78 acres of that same variety. It was of a more even growth than the winning crop and contained less admixture but was not so free from disease, having take-all along one side and ball smut scattered throughout, the latter the result of non-treatment of seed.

As was the case in the Merredin Society's competition, the third crop was of the variety Merredin. It was also very attractive, of a convenient stripping height and of very even stooling, except on one side of the plot.

The rainfall officially recorded at Bruce Rock was:—

—	Jan.	Feb.	Mch.	Apl.	Growing Period.							Nov.	D	Total for year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Bruce Rock	...	...	532	25	98	176	158	133	172	71	808	23	29	1,417

The methods of cultivation adopted by the competitors are as hereunder:—

TABLE 14.

BRUCE ROCK DISTRICT CROP COMPETITION.

ZONE 5.

Competitor.	C. Smith & Son.	Johnson, W. D.	Bristow, J. W.	McCarthy & Sons.	Harling Bros.
Years cropped	2nd	3	6	10	5
Timber ...	Salmon Gum and Gimlet	Salmon Gum and Gimlet	Salmon Gum and Gimlet	Gimlet	Gimlet, Salmon, and White Gum
Ploughed ...	June and July	August	July and Aug.	June	March
Make of Plough	Mouldboard	Mouldboard	Disc Shearer	Disc	Disc
Depth ...	3in.	3½in.	2½in.	4in.	3in. and 4in.
Condition of land at time of ploughing	Good	Getting dry	Boggy	Good	Dry
Other cultivations	Sundercut end Aug., again in Sept. and again in Oct. with Springtyne Sundercut after March rain	With Sundercut in Sept., in March. and cultivator in front of drill.	Sept. Cultivated with Springtyne in Mar. twice following Combine drill	Sundercut Aug. Springtyne Oct., March after rain and Combine drill harrows attached	Sundercut July, again in Sept. Springtyne cultivated before seeding
Variety ...	Gluclub	Nabawa	Merredin	Gluyas Late	Nabawa
Planted ...	End of April	Last week Apl.	Last week May	3rd Week Apl.	1st week May
Rate of seed ...	45lbs.	45lbs.	60lbs.	45lbs.	45lbs.
Graded ...	Yes	Yes	Yes	Yes	Yes
Treated ...	Dry	No	Dry	Yes	No
Rate of Super.	100lbs.	90lbs.	97lbs.	90lbs.	90lbs.
Disease ...	Slight traces of Takeall and Rust	Ball Smut scattered. Takeall down one side of crop	Flag Smut and a trace of Takeall	Takeall scattered and in small patches	Trace of Takeall

TABLE 14—*continued.*

BRUCE ROCK DISTRICT CROP COMPETITION—*continued.*

ZONE 5.

Competitor.	Allen Bros.	Schilling, C. E. and W. S.	Brown, S. A.	Wyatt.	Starcevich, J.
Years cropped	9 at least	Old	5	4	New land
Timber ...	Salmon Gum and Gimlet, Jam patches	Jam, York Gum, and Gimlet	Salmon Gum and Gimlet, and little Morrell	Mallee and Ti-tree	Salmon Gum and Gimlet
Ploughed ...	July	July	July	July	August
Make of plough	Mouldboard	Mouldboard	Mouldboard	Mouldboard	Mouldboard.
Depth ...	3½in.	3in.	3in	5in.	4in.
Condition of land at time of ploughing	Good	Good	Good	Good. Patches boggy	Getting dry.
Other cultivations	With Springtyne in Sept. again in Oct. again before seeding after the Mar. rain. Harrow attached to drill	Harrowed after fallowing in Aug. Sundercut in Sept. Combine drill harrows attached	Springtyne Sept. to Oct. and in April after March rains. Harrow attached to drill	Sundercut Aug. and late March. Harrows attached to drill	Disced in Sept. again before planting
Variety ...	Onas	Gluyas Early	Onas	Gluyas Early	Nabawa
Planted ...	3rd week in April	4th week in May	2nd week in May	2nd week June	Last week Apl.
Rate of Seed ...	60lbs.	60lbs	45lbs.	54lbs.	60lbs.
Graded ...	Yes	Yes	Yes	Yes	No
Treated ..	Dry	Dry	No	No	Dry
Rate of Super.	90lbs.	90lbs	90lbs.	90lbs.	70lbs.
Disease ...	Trace of Ball Smut, Flag Smut and Takeall	Trace of Flag Smut and Takeall	Little Flag Smut, Ball Smut scattered and trace of Takeall	Trace Ball Smut, Flag Smut, and Takeall	Smut and patches of Takeall

Doodlakine-Baandee District Agricultural Society.

The number of entrants for this competition was not large, nor was the general standard of the crops so high as that of the previous year.

The awards made are as hereunder:—

TABLE 15.

DOODLAKINE-BAANDEE AGRICULTURAL SOCIETY.

ZONE 5.

Judge: I. THOMAS—Superintendent of Wheat Farms.

Competitor.	District.	Variety.	Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points.	Total, 100 points
Prowse, Bros. ...	Doodlakine ...	Nabawa ...	32	17	13	13	8	83
Kay, J.... ...	Baandee ...	Gluyas Early	24	16	13	13	7	73
Barton, R., & Son	North Baandee	Gluyas Late	20	18	14	13	7	72
Barnes, F. ...	Woolundra ...	Merredin ...	24	16	12	12	8	72
Spillman, D. J.	North Baandee	Gluyas Early	24	16	12	13	7	72

The winning crop, however, was of a high standard and in marked contrast to that of the remainder. It formed part of 500 acres of the same variety, and although a thorough inspection was not made of the whole, little or no difference was apparent. It was, indeed, a pleasant sight, growing as it was on undulating country surrounded by other fields of growing crop which appeared similar to the one inspected.

The rainfall, as officially recorded at Baandee and Doodlakine, was:—

——	Jan	Feb	Mch.	Apl.	Growing Period							Nov	Dec	Total for year.
					May.	June.	July	Aug	Sept.	Oct.	Total.			
Baandee			516	28	75	178	134	90	138	49	664	32	44	1,284
Doodlakine		2	448	24	64	176	141	101	130	61	673	29	70	1,246

The methods of cultivation employed by the competitors are as hereunder:—

TABLE 16.

DOODLAKINE BAANDEE DISTRICT CROP COMPETITION - (50 ACRES)

ZONE 5.

Competitor	Prowse Bros.	Kay, J	Barton & Sons.	Barnes, F.	Spillman, D. J.
Years cropped	7 to 8 crops	Old land	New land	2nd crop	Old
Timber	Salmon Gum, Ti-tree, Gimlet, and Morrell	York Gum and Ti-tree, little Salmon Gum	Salmon Gum and Gimlet, White Gum, York, Ti-tree, and Mallee	Mallee, Gimlet, and Salmon Gum	Morrell, Salmon Gum and Gimlet
Ploughed	July	End of July	1st week Aug.	July	July and Aug
Type of Plough	Mouldboard	Mouldboard	Disc	Disc	Mouldboard
Depth	3½in.	3in and 4in.	3in.	3½in. and 4in.	3in. and 4in
Condition of land at time of ploughing	Good	Getting dry	Good	Good	Fairly good (somewhat wet)
Other cultivations	Disc cultivation in Sept. again before seeding and Springtyned after Disc.	Cultivated with Springtyne after rain in Mar., and with Sundercut prior to seeding	Cultivated with Duckfoot. Scarifier following harrows immediately prior to planting	Cultivated with Springtyne in Aug Harrows attached to Drill	Cultivated with Sundercut in Sept Springtyned in March (some twice)
Variety .	Nabawa	Gluyas Early	Gluyas Late	Merredin	Gluyas Early
Planted ...	1st and 2nd week May	Last week May	2nd week May	3rd week May	Last week May
Rate of Seed...	45lbs.	50lbs.	60lbs.	60lbs	45lbs.
Graded ..	Recleaned	Yes	Yes	Yes	Yes
Treated ...	No	Dry	Dry	Yes	Dry
Rate of Super.	90lbs.	100lbs.	90lbs.	80lbs.	60lbs
Disease ...	Trace of Rust, Footrot and Smut	Flag Smut and trace of Take-all	A few dummy heads apparently due to climatic and soil conditions	Trace of Ball Smut, Flag Smut, and more than a trace of Foot-rot	Rust, Foot Rot, and Flag Smut were noted

Royal Agricultural Society.

Two competitors who entered direct with the Royal Agricultural Society submitted their crops for inspection. They were Mr. R. B. Nottage of Tammin and Mr. J. D. Hammond of Kellerberrin.

The awards made are set out in the table hereunder:—

TABLE 17.—THE ROYAL AGRICULTURAL SOCIETY.—ZONE 5.
Judge I. THOMAS—Superintendent of Wheat Farms.

Competitor	District	Variety.	Yield, 40 points.	Freedom from Weeds, 20 points.	Freedom from Disease, 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points.	Total, 100 points.
Nottage, R. B....	Tammin ..	**Nabawa**	26	17	13	13	8	**77**
Hammond, J. D	Kellerberrin ...	**Nabawa** .	25	17	13	14	7	**76**

The rainfall, as officially recorded at Tammin and Kellerberrin, was:—

—	Jan.	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total for year.
					May.	June	July.	Aug	Sept.	Oct.	Total.			
Tammin	6	14	495	20	106	202	238	166	94	120	926	40	4	**1,505**
Kellerberrin	...	8	599	29	107	219	170	145	136	102	939	48	4	**1,567**

The methods of cultivation practised by the competitors are as hereunder:—

ROYAL CROP COMPETITION.
ZONE 5.

Competitor	R. B. Nottage.
Years cropped fallowed ...	2nd.
Timber	Salmon Gum, Gimlet and Morrell.
Ploughed	July and August.
Type of Plough	Tandem Disc.
Depth	2½in.
Condition of land at time of ploughing	Good.
Other cultivations	With sundercut in April followed by combine drill.
Variety	Nabawa
Planted	2nd week in June.
Rate of seed	**55lbs.**
Graded	**Yes.**
Treated	**No.**
Rate of super.	**70lbs.**
Disease	**Takeall and very slight trace of smut.**

ZONES 4, 6, 7, AND 8.

Judge : A. S. WILD, B.Sc. (Agric.), Agricultural Adviser.

ZONE 4.

With one exception, all the entries received for this zone were from the Nungarin District Agricultural Society, Mrs. E. H. Richards of Southern Cross entering direct with the Royal Agricultural Society.

Nungarin Agricultural Society.

Of the twelve entries received, eleven crops were submitted for inspection. Five of these were crops of the variety Nabawa, five of Gluyas Early and one of Caliph. In all the crops inspected, traces of spring rust were noticed.

The points awarded are as hereunder:—

TABLE 18

NUNGARIN AGRICULTURAL SOCIETY.

ZONE 4

Judge A. S. WILD—Agricultural Adviser.

Competitor.	District.	Variety.	Yield 40 points.	Freedom from weeds. 20 points	Freedom from Disease 15 points	Freedom from Admixture. 15 points	Evenness of Growth. 10 points	Total. 100 points.
1—Reynolds, A G	Mukinbudin	Gluyas Early	35	18	13	13	9	88
2—Young G. T	Talgomine	Gluyas Early	33	17	14	14	8	86
3—Jolly, H. P	Mangowine ..	Nabawa .	29	18	14	12	9	82
4—Williams, F A.	Mangowine	Nabawa .	31	18	14	12	7	82
5—Creagh, Bros	Kwelkan .	Gluyas Early	29	18	13	12	9	81
6—Johnston, J	Mangowine ..	Nabawa .	25	19	11	14	9	81
7—Dumsday, L.	Talgomine ..	Nabawa ...	29	17	13	13	7	79
8—Watson Bros	Nungarin .	Gluyas Early	29	18	13	10	9	79
9—Fitzpatrick, R.	Nungarin ...	Nabawa ...	27	18	13	13	7	78
10—Mulqueeny, J.	Lake Brown ..	Gluyas Early	26	17	13	12	8	76
11—Herbert, G H.	Nungarin ..	Caliph ..	28	17	11	12	8	76

The winning crop, that of Mr. A. G. Reynolds of Mukinbudin, was planted with the variety Gluyas Early at the beginning of May at the rate of 38lbs. of seed per acre, 100lbs. of superphosphate per acre being applied. This crop was of very even growth and except for small patches of thistles and silver grass was free from weeds. It contained a few strange heads of other varieties and scattered wild oats.

The heads were well filled and the general appearance of the crop gave one the impression of its being a heavy yielder, this being confirmed by the subsequent calculated yield, which was 35 bushels per acre.

Mr. G. T. Young's crop, which secured second place, was also of the variety Gluyas Early—a good even crop except in a few small, hard patches. It was free from admixture but contained various weeds, fortunately not numerous, including wild oats. This crop was planted about the middle of May at the rate of 45lbs. of graded treated seed and 85lbs. of superphosphate per acre.

All the crops entered by this Society were of a high standard, and the interest and friendly rivalry displayed by the competitors is worthy of favourable comment.

The rainfall, as officially recorded at Nungarin, Mangowine and Mukinbudin during 1927, was:—

—	Jan.	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total for year.
					May.	June	July.	Aug.	Sept.	Oct.	Total			
Nungarin	8	4	455	60	67	210	209	67	122	88	763	26	33	1,349
Mangowine	22	5	530	62	55	309	236	100	135	28	863	50	15	1,547
Mukinbudin	. .	.	620	64	51	219	226	70	173	22	761	18	13	1,476

The details of the methods of cultivation and cropping employed by the various competitors are as hereunder:—

TABLE 19.

NUNGARIN DISTRICT CROP COMPETITION.

ZONE 4.

Competitor	Reynolds, A. G	Young, G. T.	Jolly, H. P.	Williams, F A.
Years cropped ,, fallowed	10. 5 and 6 crops	3rd crop	14 years. About 10 crops	4th crop
Timber .	Salmon and Gimlet	Salmon and Gimlet	Morrell, Salmon and Gimlet	Salmon, Gimlet and Mallee
Ploughed	Middle of June	July	Beginning of June	July
Type of Plough	Federal Disc	Martin Mouldboard	Sundercut	Sundercut
Depth	3½in. to 4in.	4in. to 4½in.	4in	3in. to 4in
Condition of land at time of ploughing	Excellent	Good	Excellent	Part good, and some dry
Other cultivations	Disced 2½in. 1st wk. in August. Cultivated end Sept. Harrowed in Oct. Cultivated March. Harrowed March. Drilled with Combine	Skimmed with Sundercut end of March and end of April. Springtyned end April Harrowed behind drill	Harrowed after fallowing, cultivated Sept. without drag harrows. Cultivated March with drag harrows Drilled Combine	Skim ploughed September and harrowed. Springtyned last week April
Variety ..	Gluyas Early	Gluyas Early	Nabawa	Nabawa
Planted ...	1st week May	18th May	Middle of May	Middle of May
Rate of Seed...	38lbs.	45lbs.	45lbs.	45lbs.
Graded ...	Recleaned	Yes	Recleaned	Yes
Treated ...	Yes (dry)	Yes (dry)	Yes (dry)	Yes (dry)
Rate of Super.	98lbs. to 100lbs	85lbs.	75lbs.	60lbs.
Disease ...	Trace of Rust	Trace of Rust	Trace of Rust	Trace of Rust

NUNGARIN DISTRICT CROP COMPETITION—*continued.*

ZONE 4

Competitor.	Creagh, Bros.	Johnson, J.	Dumsday, L.	Watson Bros.
Years cropped „ fallowed	5 or 6 crops	3rd crop	1st crop	Wheat continuously for 10 years. Fallow, wheat rotation for 5 years
Timber ...	Salmon, Gimlet and Morrell	Salmon, Gimlet and York	Salmon and Gimlet	Salmon and Gimlet
Ploughed ...	July	Middle of June to middle July	July	Early July
Type of Plough	Sundercut	Sunrise Disc	Disc	Sundercut
Depth	3½in. to 4in.	4in.	3in.	3½in. to 4in.
Condition of land at time of ploughing	Good	Good	Good	Good
Other Cultivations	Skim ploughed end Sept. Cultivated end Mar. Drilled with Combine	Springtyned Aug. and harrowed. Cultivated end of March and harrowed. Drilled with Combine	Springtyned Sept. and Mar. Planted with Combine	Skim ploughed end of Sept. Cultivated with Disc. harrows in March
Variety ...	Gluyas Early	Nabawa	Nabawa	Gluyas Early
Planted ...	Middle of May	May 5th to 16th	1st week in May	End of April
Rate of Seed ...	45lbs.	45lbs	45lbs.	48lbs.
Graded	Recleaned	Yes	Yes	No
Treated ..	Yes (dry)	Yes (dry)	Yes (dry)	Yes (dry)
Rate of Super.	80lbs.	70lbs.	100lbs.	80lbs.
Disease ..	Trace of Rust and Flag Smut	Trace of Rust	Trace of Rust and Flying Smut	Trace of Rust and Flag Smut

Competitor.	Fitzpatrick, R.	Mulqueeny, J.	Herbert, G. H.
Years cropped „ fallowed	1st crop	3rd crop	10 years
Timber ..	Scrub	Mallee and Gimlet	Salmon, Gimlet and Morrell
Ploughed ..	Middle of August	Early July	June
Type of Plough	State Disc	State Disc	Duckfoot scarifier
Depth	5in.	4in.	2in.
Condition of land at time of ploughing	Good	Good	Good
Other Cultivations	Rolled before and after seeding	Skim ploughed early Sept. Springtyned in March and again before seeding	Reploughed with scamper. Skim ploughed again end August. Springtyned early Oct. Harrowed twice in Mar. Skimmed prior to seeding. Drilled with Combine
Variety ...	Nabawa	Gluyas Early	Caliph
Planted ...	End of April	Middle of May	End of April
Rate of Seed ...	60lbs.	45lbs.	32lbs.
Graded ...	No	Recleaned	Recleaned
Treated ...	No	Yes (dry)	Yes
Rate of Super.	90lbs.	70lbs.	90lbs.
Disease ...	Trace of Rust and Flying Smut	Trace of Rust and Flag Smut	Trace of Rust, Flying Smut, Flag Smut, and Ball Smut

Royal Agricultural Society.

The competing crop of Mrs. E. H. Richards of Southern Cross, which was entered direct with the Royal Agricultural Society, is of particular interest, owing to it being situated on the fringe of the Eastern Wheat Belt. The soil was a red friable loam from which had been cleared Salmon Gum and Gimlet timber prior to being prepared for this its 10th crop.

The points awarded are:—

ROYAL AGRICULTURAL SOCIETY.

Name.	District.	Variety.	Estimated Yield	Freedom from Weeds.	Freedom from Disease.	Freedom from Admixture.	Evenness of Growth.	Total.
			40 pts.	20 pts.	15 pts.	15 pts.	10 pts.	100 pts.
Richards, E. H.	Southern Cross	Gluyas Early	29	18	18	12	9	81

The variety Gluyas Early was planted about the middle of May at the rate of 33 to 40 lbs. of graded seed with an application of superphosphate at the rate of 75 to 80 lbs. per acre. It was a fine even crop and was calculated to yield 29 bushels per acre. Except at one end it was comparatively free from weeds, but traces of flag and ball smut were noticed. The crop also contained a few strange plants of other varieties and a little barley.

The rainfall, as officially recorded at Southern Cross, was:—

——	Jan.	Feb.	Mch.	Apl.	Growing Period.							Nov.	Dec.	Total for year
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Southern Cross	13	30	665	53	138	67	165	48	322	39	779	30	19	1,580

The details of cropping and cultivation are as hereunder:—

TABLE 20
ROYAL CROP COMPETITION
ZONE 4

Competitor	Richards, E. H.
Years cropped	1st crop
Timber	Salmon and Gimlet
Ploughed	End of June
Type of Plough	Sundercut
Depth	3in. and 4in.
Condition of land at time of ploughing	Good
Other Cultivations . .	Springtyned in August, November, April and March
Variety	Gluyas Early
Planted	Middle May
Rate of Seed	30lbs to 40lbs.
Graded	Recleaned
Treated	Yes (dry)
Rate of Super.	75lbs. to 80lbs.
Disease	Trace of Flag Smut and Ball Smut

ZONE 6.

Three entries were received by the Royal Agricultural Society, no district society conducting crop competitions in this zone.

The points awarded are as hereunder.—

TABLE 21.—ROYAL AGRICULTURAL SOCIETY.—ZONE 6.
Judge · A. S. WILD— Agricultural Adviser.

Competitor.	District.	Variety.	Yield. 40 points.	Freedom from weeds 20 points.	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points.	Evenness of Growth 10 points.	Total. 100 points.
Richards, T.	South Caroling	Nabawa ...	34	18	14	14	8	88
McLean, J ...	County Peak ..	Nabawa .	29	18	14	14	8	83
Smith, H. D. ...	Beverley .	Yandilla King	24	18	12	13	9	76

The winning crop of Nabawa variety was submitted by Mr. T. Richards, senior, of South Caroling. This was planted during the third week in May at the rate of 50lbs. of seed per acre. A dressing of superphosphate, 120lbs. per acre, was applied. The plants were well stooled, well headed and fairly even in height, and the crop showed marked freedom from weeds, disease and admixture. It was calculated to yield 34 bushels to the acre. The land, which was Salmon Gum and Gimlet country, had been carefully prepared for this crop.

Mr. Richards, who won the cup for his zone in the Wheat Yields Competition 1924-26, is to be congratulated on his further success.

The crop of Mr. John McLean, of County Peak, which secured second place, was also very creditable. This was planted with the variety Nabawa during the last week in May at the rate of 65lbs. of graded seed per acre, 112lbs. of superphosphate per acre being applied. The original timber on the undulating land was Morrell and Salmon Gum, with one corner of Jam. The plants were well headed and well stooled. Small patches of take-all were noticed, and scattered through the crop were a number of empty heads. Weed growth was limited to a few mustard plants and some cockspurs. The calculated yield of this crop was 29 bushels per acre.

The crop of Mr. H. D. Smith, of Beverley, was of the variety Yandilla King. It was planted during the second week in May with 43lbs. of ungraded seed per acre. Superphosphate was applied at the rate of 70lbs. per acre. This was a very even crop and at first sight appeared to be a much heavier yielder than it actually was. However, it was badly affected by rust. Small patches of take-all were noticed. A few heads of wheat varieties other than Yandilla King, together with wild oats and drake, were scattered through the crop.

It is to be regretted that more entries were not received in Zone 6. Much more benefit would be derived from the competition if greater interest were taken in this direction.

The rainfall, as officially recorded at Beverley, South Caroling and Bally Bally (County Peak), was:—

—	Jan.	Feb.	Mch	Apl.	Growing Period.							Nov.	Dec.	Total for year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Beverley	9	21	337	50	103	303	319	167	189	126	1,207	31	7	1,662
South Caroling	...	...	338	43	110	210	203	117	131	105	876	49	...	1,306
Bally Bally	...	...	361	28	97	248	263	181	144	188	1,121	40	6	1,556

The cultural details of cropping are as hereunder:—

TABLE 22
ROYAL CROP COMPETITION
ZONE 6.

Competitor.	Richards, T.	McLean, John.	Smith, H. D.
Years cropped . . . „ fallowed . . .	18 years ..	20 years .	4th crop 2 fallows
Timber	Gimlet and Salmon	Morrell, Salmon and Jam	Jam and Manna Gum
Ploughed	July	July	September
Type of Plough	State Mouldboard	Massey Mouldboard	Mouldboard
Depth	4½in. and 5in.	4in.	4in.
Condition of land at time of ploughing	Good	Good	Good
Other Cultivations ..	Springtyned in Sept, and 3 or 4 times after the winter rains and again after March rains	Springtyned twice in Sept., part sundercutted in March and all skimmed with sundercut before drilling. Springtyned and harrowed just after drilling	Springtyned in April. Drilled with Combine.
Variety	Nabawa	Nabawa	Yandilla King
Planted	20th May	Last week in May	2nd week in May
Rate of Seed	50lbs.	65lbs.	43lbs.
Graded	Yes	Yes	No
Treated	Yes (dry)	Yes (dry)	No
Rate of Super.	120lbs.	112lbs.	70lbs.
Disease	Trace of Rust	Whiteheads and small patches of Take-all	Rust, Take-all and Septoria

ZONE 7.

The crops entered in the Kulin District Agricultural Society's crop competition were the only competitors in this zone.

The awards made in this competition are as hereunder:—

TABLE 23
KULIN AGRICULTURAL SOCIETY
ZONE 7.
Judge: A. S. WILD—Agricultural Adviser

Competitor.	District.	Variety.	Estimated Yield, 40 points.	Freedom from weeds, 20 points.	Freedom from Disease. 15 points.	Freedom from Admixture, 15 points.	Evenness of Growth, 10 points.	Total, 100 points.
Nichols, R. ...	Kulin	Nabawa ...	30	19	13	13	8	83
Roberts Bros. ..	Kulin	Hard Federation	28	18	14	12	8	80
Bighn, E. J. ...	Karlgarin ...	Nabawa ...	28	18	13	12	8	79
Parker & Baldock	Kulin	Nabawa ..	24	19	14	13	8	78
Trotter, A. W....	Kulin	Hard Federation	25	18	13	13	7	76
Dowey, P. J. ...	Kulin	Gluyas Late	22	17	14	14	7	74
Weaver, A. J. ...	Kulin	Nabawa ...	23	19	14	11	7	74
Hooper, W. ..	Kulin	Nabawa ...	25	16	12	12	7	72

Further entries were received, but only eight crops were submitted for inspection. It was unfortunate that some competition crops had been and others were being stripped at the time of inspection, thus necessitating so many withdrawals.

Mr. R. Nichols secured first place with his crop of the variety Nabawa, planted during the second week in May at the rate of 55lbs. of seed and 80lbs. of superphosphate per acre. This was a heavy crop containing only a few strangers and barley heads. The weeds were confined to a few cockspurs and thistles. Small quantities of take-all, flying smut and spring rust were noticed.

The rainfall, as officially recorded at Kulin, was:—

—	Jan	Feb	Mch	Apl	Growing Period							Nov.	Dec	Total for year
					May	June	July	Aug	Sept.	Oct	Total.			
Kulin		7	220	32	182	264	220	122	137	166	1,091	20	11	1,381

The cultural details of the cropping are as hereunder:—

TABLE 24.

KULIN DISTRICT CROP COMPETITION

ZONE 7

Competitor	Nicholas, R	Roberts Bros.	Bighin, E. J.	Parker & Baldock.
Years cropped ,, fallowed	4th crop	Unknown	4th crop 1 fallow	2nd crop 1 fallow
Timber	York Gum, Jam, Mallee, odd Salmon	York, Jam, Morrel, Mallee	Salmon and Gimlet	Morrell, Salmon, Blackbutt and Ti-tree
Ploughed	End of July	July	July	June
Type of Plough	Shearer Disc	Shearer Disc	Disc	Mouldboard skim
Depth	3in	3in. and 3½in.	3½in and 4in.	2in.
Condition of land at time of ploughing	Good	Wet	Hard in patches	Good
Other cultivations	Skim ploughed August, Springtyned Sept. and Nov. after rain Springtyned Feb	Skim ploughed August, Springtyned March Drilled with Combine	Cross ploughed 4in. in August Springtyned early October Springtyned after Mar rains and before drilling	Springtyned Aug. Drilled with Combine
Variety	Nabawa	Hard Federation	Nabawa	Nabawa
Planted	From 8th May	30th May	1st week May	10th May
Rate of Seed	55lbs	60lbs.	50lbs.	50lbs.
Graded	Yes	Yes	Recleaned	Yes
Treated	Yes (dry)	Yes (dry)	Yes (dry)	Yes (dry)
Rate of Super.	80lbs.	120lbs	80lbs	64lbs
Disease	Trace of Rust, Take-all and Flying Smut	Trace of Flag Smut and Whiteheads	Trace Ball Smut	Trace Leaf Spot and Whiteheads

KULIN DISTRICT CROP COMPETITION—*continued.*

ZONE 7.

Competitor	Trotter, A. W.	Bowey, P. J.	Weaver, A. J.	Hooper, W.
Years cropped ... „ **fallowed** ...	3rd crop 2 fallows	Unknown ...	1st crop ...	4 crops 1 fallow
Timber	Jam and York Gum	Salmon with sprinkling of Morrell	York, Jam and Salmon	Salmon and Morrel Mallee one end
Ploughed	August	End of June	End of July	June
Type of Plough ...	Shearer Disc	Disc	Springtyne Cultivator	Sundercut
Depth	4in.	3in	2in	5in.
Condition of land at time of ploughing	Satisfactory	Good	Good	Good
Other cultivations	Skim ploughed end Sept. Springtyned end Nov. and before seeding	Springtyned Aug and drilled with Combine	Springtyned to 3in. at end of August. Duckfoot cultivated before drilling	Skim ploughed Aug. and Mar. Drilled with Combine
Variety .. .	Hard Federation	Gluyas Late	Hard Federation	Nabawa
Planted	Middle of May	2nd week May	3rd Week in April	Middle April
Rate of Seed ..	60lbs	48lbs.	50lbs.	60lbs
Graded	Yes	Yes	Yes	Yes
Treated	Yes (dry)	Yes (dry)	Yes (dry)	Yes (wet)
Rate of Super. ..	90lbs.	85lbs	60lbs	100lbs.
Disease . .	Trace of Rust and Flying Smut		Trace of Rust and Take-all	Ball Smut and Whiteheads

ZONE 8.

With one exception all the competitors who submitted their crops for inspection in this zone were entered in the Gnowangerup Agricultural Society's crop competition. Of the three entries received by the Royal Agricultural Society, two withdrew.

Gnowangerup District Agricultural Society.

In the competition of the above Society, thirteen entries were received, but owing to withdrawals only eight crops were inspected.

The awards made are as hereunder:—

TABLE 25

GNOWANGERUP AGRICULTURAL SOCIETY.

ZONE 8

Judge A. S. WILD—Agricultural Adviser

Competitor	District	Variety	Yield 40 points.	Freedom from weeds. 20 points.	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points	Evenness of Growth. 10 points	Total. 100 points.
Parkinson, A. W	Gnowangerup	Yandilla King	40	19	13	13	9	94
Murray, C	Borden	Nabawa ..	35	18	14	14	8	89
Davis, N. L. P.	Gnowangerup	Yandilla King	34	18	13	14	8	87
White, A. J.	Pallinup ...	Walkers ..	33	19	14	13	8	87
McDonald, J. ..	Gnowangerup	Nabawa	33	18	13	14	8	86
Barnard, C. E....	Pallinup .	Turvey .	29	17	12	12	8	78
Richards, C. J...	Gnowangerup.	Yandilla King	28	15	12	13	7	75
Wyatt, C. A. ..	Pallinup .	Nabawa ..	27	16	11	14	7	75

The winning crop was of the variety Yandilla King. It was even in height, well stooled and headed and very dense. Although infected slightly by stem rust, the grain was normal. The weeds had been kept under control by thorough cultural operations assisted by pasturing of sheep on the land before and during the fallow period. This crop reflected great credit on its owner, Mr. A. W. Parkinson, who is to be congratulated on winning not only the district competition and the zone championship, but also the Royal Agricultural Society's special prize for the highest yield in any zone.

A. W. Parkinson's 50 acres "Yandilla King."

The crop had been planted during the second week in May with 45lbs. of graded seed to the acre and an application of 112lbs. of superphosphate per acre.

The crops entered by the Gnowangerup Society were all of a high standard. That of Mr. C. A. Wyatt, which showed exceptional promise earlier in the year, was unfortunately affected by take-all and root-rot.

The rainfall as officially recorded at Gnowangerup was:—

——	Jan.	Feb	Mch	Apl.	Growing Period.							Nov.	Dec.	Total for year.
					May.	June.	July.	Aug.	Sept	Oct.	Total			
Gnowangerup	70	6	177	72	74	259	169	115	378	253	1,248	28	24	1,625

The methods of cultivation and other details are as hereunder:—

TABLE 26.—GNOWANGERUP DISTRICT CROP COMPETITION.—ZONE 8.

Competitor.	Parkinson, A. W.	Murray, G.	Davis, N. L. P	White, A. J.
Years cropped ..	10 years	1st crop	About 7 crops	3rd or 4th crop
Timber ...	York, Morrell, Jam	Poot, Jam, Mallee	York and Morrell	Morrell, York, Manna Gum
Ploughed	July	Early August	Middle July to end of August	July and August
Type of Plough ...	Smith Mouldboard	Shearer Mouldboard	State Mouldboard	Shearer Mou board

GNOWANGERUP DISTRICT CROP COMPETITION—*continued.*

ZONE 8.

Competitor.	Parkinson, A. W.	Murray, G.	Davis, N. L. P.	White, A. J.
Years Cropped ...	10 years	1st crop	About 7 crops	3rd or 4th crop
Depth	3½in. and 4in.	2in	3½in and 4in	3½in. and 4in.
Condition of land at time of ploughing	Good	Good and bad	Good	Good
Other cultivations	Harrowed after ploughing. Springtyned Disc ploughed to 2½in., then harrowed and left. In Mar Springtyned and disced where thistles growing. cultivated in front of Drill and harrowed after Drill	Springtyned once in February	Skim ploughed early October. Springtyned end of April Drilled with Combine with light drag harrows	Springtyned Sept. and again in Spring. Drilled with Combine
Variety . .	Yandilla King	Nabawa	Yandilla King	Walker, S
Planted	2nd week May	3rd week May	Middle May	1st fortnight in May
Rate of Seed	45lbs	42lbs.	45lbs.	50lbs
Graded	Yes	Yes	Yes	No
Treated	Yes (formalin)	Yes (dry)	Yes (dry)	Yes (formalin)
Rate of Super	112lbs.	88lbs	96lbs.	80lbs
Disease .	Rust, trace Flying Smut and Take-all	Trace of Rust and Take-all	Rust and patches of Take-all	Small patches Takeall and Rootrot

Competitor	McDonald, J	Barnard, C. E	Richards, C. J	Wyatt, C. A.
Years cropped .	About 10 crops	3 crops	20 years	5th Crop
Timber . .	Salmon, Morrell, Wattle, York	White Gum and Morrell	York and Poot	Poot and York Gum
Ploughed	End of July	June	End of July	July and August
Type of Plough .	State Mouldboard	Mouldboard	Massey Mouldboard	State Mouldboard
Depth . .	3in	4in	4in.	3½in.
Condition of land at time of ploughing	Fairly good	Good	Good	Good
Other cultivations	Light harrowed after ploughing, Disced in Sept Springtyned and harrowed 1st week in March. Harrowed again before drilling Drag harrows behind Drill	Skim ploughed in Sept. Springtyned in Sept Oct. and April Drilled with Combine with light drag	Springtyned Sept and before drill. Light harrows after Drill	Harrowed lengthways and crossed directly after fallowing. Skim ploughed Sept. and harrowed lengthways Ploughed back 3rd week in May, length harrowed and cross harrowed after Drill
Variety	Nabawa	Turvey	Yandilla King	Nabawa
Planted .. .	23rd—26th May ...	15th—18th May	Middle May	End of May and beginning of June
Rate of Seed ...	52lbs	50lbs.	70 to 80lbs.	50lbs.
Graded	Yes	Yes	Recleaned	Yes
Treated	Yes	Yes (formalin)	Yes (wet)	No
Rate of Super. ...	96lbs.	60lbs.	60lbs.	70lbs.
Disease	Trace Rust, Take-all and Rootrot	Rust in patches, Take-all, Rootrot, Flying Smut	Take-all, Rootrot, Rust, and Flying Smut	Take-all, Rootrot and Rust

Royal Agricultural Society.

Mr. M. Clifford, of Gillimanning, was the only competitor in Zone 8, who entered direct with the Royal Agricultural Society.

The points awarded for this crop are as hereunder:—

Name	District	Variety.	Estimated Yield.	Freedom from Weeds.	Freedom from Disease.	Freedom from Admixture.	Evenness of Growth.	Total.
			40 pts.	20 pts.	15 pts.	15 pts.	10 pts.	100 pts.
Clifford, M.	Gillimanning	Federation	29	17	13	14	7	80

The rainfall as recorded at Wickepin, the nearest official recording station, was:—

—	Jan.	Feb.	Mch.	Apl.	Growing Period. May.	June.	July.	Aug.	Sept.	Oct.	Total.	Nov.	Dec.	Total for year.
Wickepin	2		173	42	111	416	251	139	109	168	1,194	54	25	1,490

The details of the cropping are as hereunder:—

TABLE 27.
ROYAL CROP COMPETITION.
ZONE 8.

Competitor	Clifford, M.
Years cropped	Old land 4 years under pasture
Timber	York Gum, White Gum, Jam and Wattle
Ploughed	July, August and September
Type of Plough	Mouldboard
Depth	5in.
Condition of land at time of ploughing	Good
Other Cultivations	Springtyned twice in Spring, again before drilling and again in front of the Drill
Variety	Federation
Planted	Up to 13th May
Rate of Seed	72lbs.
Graded	Yes
Treated	Yes (dry)
Rate of Super	120lbs.
Disease	Take-all and Rootrot. Trace of Flying Smut and Septoria

CHAMPIONSHIP CROP COMPETITIONS.

ROYAL AGRICULTURAL SOCIETY.

The entrants for these championship prizes are the first and second prize winners of the district competitions, and also the competitors who enter direct with the Royal Agricultural Society.

The competitors in the different zones and the total points allotted are shown in the table hereunder:—

REPRESENTATIVES FROM DISTRICT CROP COMPETITIONS.

Zone.	Competitor	Society.	Variety	Yield, 40 points.	Freedom from Weeds, 20 pionts.	Freedom from Disease, 15 points	Freedom from Admixture, 15 points	Evenness of Growth, 10 points.	Total 100 points.
1	Bothe, B. D	Royal	Nabawa .	39	15	13	14	9	90
	Hebiton, J. K.	Royal	Merredin	30	17	13	14	8	82
2	Martin, K. J.	Dalwallinu ..	Ford	30	18	14	11	8	81
	Harris, W. M.	Dalwallinu ...	Nabawa .	26	16	13	14	8	77
3	Threfall, G.,	Wyalkatchem	Nabawa ..	34	19	14	14	9	90
	Ferries, H. C	Wyalkatchem	Nabawa ..	32	19	14	13	8	86
	Parker, A. E.	Wongan Hills	Nabawa ...	30	17	14	14	8	83
	Bear, H. E..	Dowerin .	Gluyas Early	28	18	14	13	9	82
	Cosh, C E.	Dowerin	Gluyas Early	26	19	14	14	8	81
	Ackland, J. H.	Wongan Hills	Nabawa . .	28	17	13	14	8	80
4	Reynolds, A. G.	Nungarin .	Gluyas Early	35	18	13	13	9	88
	Young G. T.	Nungarin	Gluyas Early	33	17	14	14	8	86
	Richards, E. H	Royal .	Gluyas Early	29	18	13	12	9	81
5	Rowan, C. ...	Merredin .	Nabawa ...	34	17	13	13	8	85
	Pollock, R..	Merredin . .	Nabawa .	32	17	13	13	9	84
	Prowse Bros.	Doodlakine and Baandee	Nabawa	32	17	13	13	8	83
	Smith, C., & Sons	Bruce Rock	Gluclub ...	33	17	13	13	7	83
	Johnson W. D.	Bruce Rock	Nabawa ...	31	17	12	14	8	82
	Nottage, R. D.	Royal	Nabawa ..	26	17	13	13	8	77
	Hammond, J. D.	Royal ..	Nabawa ..	25	17	13	14	7	76
	Kay, J. ...	Doodlakine and Baandee	Gluyas Early	24	16	12	13	7	72
6	Richards, T.	Royal	Nabawa .	34	18	14	14	8	88
	McLean, J....	Royal ...	Nabawa ...	29	18	14	14	8	83
7	Nichols, R ...	Kulin .	Nabawa . .	30	19	13	13	8	83
	Roberts Bros.	Kulin .	Hard Federation	28	18	14	12	8	80
8	Parkinson, A. W.	Gnowangerup	Yandilla King	40	19	13	13	9	94
	Murray, G.	Gnowangerup	Nabawa . .	35	18	14	14	8	89
	Clifford, M.	Royal ...	Federation	29	17	13	14	7	80

ROYAL SOCIETY ZONE AWARDS.

The Final Awards in each Zone have been made and are as follows.—

Zone.	Competitor.	Address.	Society.	Variety.	Total point.	Place.
1	Bothe, B. D.	Coorow	Royal	Nabawa	90	1st
	Hebiton, J. K.	Three Springs	Royal	Merredin	82	2nd
2	Martin, K. J.	Dalwallinu	Dalwallinu	Ford	81	1st
	Harris, W. M.	Dalwallinu	Dalwallinu	Nabawa	77	2nd
3	Threfall, G.	Korrelocking	Wyalkatchem	Nabawa	90	1st
	Ferries, H. C	Wyalkatchem	Wyalkatchem	Nabawa	86	2nd
4	Reynolds, A. C	Mukinbudin	Nungarin	Gluyas Early	88	1st
	Young, G. T.	Talgomine	Nungarin	Gluyas Early	86	2nd
5	Rowan, C	Korbel	Merredin	Nabawa	85	1st
	Pollock, R.	Korbel	Merredin	Nabawa	84	2nd
6	Richards, T.	South Caroling	Royal	Nabawa	88	1st
	McLean, John	County Peak	Royal	Nabawa	83	2nd
7	Nichols, R.	Kulin	Kulin	Nabawa	83	1st
	Roberts Bros.	Kulin	Kulin	Hard Feneration	80	2nd
8	Parkinson, A. W.	Gnowangerup	Gnowangerup	Yandilla King	94	1st
	Murray, G.	Borden	Gnowangerup	Nabawa	89	2nd

LEADING COMPETITORS FOR ROYAL SOCIETY'S SPECIAL PRIZE FOR HIGHEST YIELD IN ANY ZONE.

Zone.	Competitor.	Address.	Variety.	Calculated Yield.
				bushels
8	Parkinson, A W.	Gnowangerup	Yandilla King	40
1	Bothe, B. D	Coorow	Nabawa	39
8	Murray, G	Borden	Nabawa	35
4	Reynolds, A. C.	Mukinbudin	Gluyas Early	35
8	Davies, N. L. P	Borden	Nabawa	34
5	Rowan, C.	Korbel	Nabawa	34
6	Richards, T.	South Caroling	Nabawa	34
3	Trelfall, G.	Korrelocking	Nabawa	34
8	McDonald, J.	Gnowangerup	Nabawa	33
5	Smith & Sons	Yarding	Gluclub	33
8	White, A. J	Pallinup	Walker's	33
4	Young, G. T	Talgomine	Gluyas Early	33
3	Ferries, H. C.	Wyalkatchem	Nabawa	32
5	Pollock, R.	Korbel	Nabawa	32
5	Prowse, Bros	Doodlakine	Nabawa	32
5	Johnson, W. D.	Bruce Rock	Nabawa	31
3	Lindsay, J.	Wyalkatchem	Nabawa	31
3	Payne, Mrs	Korrelocking	Merredin	31
4	Williams, F. A.	Nungarin	Nabawa	31
1	Hebiton, J K.	Three Springs	Merredin	30
2	Martin, K J.	Dalwallinu	Ford	30
7	Nichols, R.	Kulin	Nabawa	30

The Season.—In March very heavy general rains were experienced over the whole of the wheat belt. This caused the weed seeds on the fallow to germinate readily. The subsequent growth was destroyed by cultivation, and in some cases sheep were utilised to check their growth, so enabling the cultivators to do more effective work.

This cultivation forming a mulch, in addition to destroying weeds, also assisted to conserve moisture.

Following on the March rains, the rainfall during the growing period (May-October), although light, was regular and sufficient until towards the end of August.

During the growing period the climatic conditions were ideal for the growth of the wheat plant. Clear, frosty nights were experienced in most districts; this prevented flaggy growth and encouraged the plants to stool out better. Under these conditions, the development of the disease Septoria was retarded, and although it was present in some of the crops, it was in a mild form, and little or no damage was caused.

However, the weather conditions during October were favourable for the disease stem rust. This disease was noticed in all districts to a greater or lesser degree, and in some districts it was in epidemic form and considerable loss resulted.

Entries.—The total number of competing crops inspected was 100 as compared with a similar number last year. Of these 13 were entered direct with the Royal Agricultural Society and the remainder with the local district Agricultural Societies. Exclusive of the Royal Agricultural Society, 10 district Agricultural Societies were represented. The work of these Societies is undoubtedly commendable for stimulating district pride and rivalry along the most desirable lines.

Fallowing.—Both the disc and mouldboard type of plough were favoured for the initial operation, but in this connection it is pointed out that the nature of the soil is one of the deciding factors as to which type of implement is to be used. The important point, however, is to do the work thoroughly, no matter what type of implement is used.

The average depth of ploughing was from three to four inches. Most of the competitors' aim was to complete this operation as early as possible, the majority commencing in June or July. The results of an experiment carried out at the Merredin Experiment Farm have shown that early fallowed land returns, on the average, better yields than the late fallowed land. In this experiment, over a period of three years, the June fallowed plots yielded an average of 5 bushels 4lbs more per acre per year than those fallowed during the last week in August.

There was also a marked similarity in the methods adopted in connection with the cultivation of the fallow, the object being to conserve the moisture, destroy weed growth, and consolidate the seed bed. The springtyne cultivator was generally favoured for general cultivation of the land, but where the land had become hard or weedy the disc cultivating plough was used.

Varieties.—The most popular variety was "Nabawa," with which 50 of the competition crops were planted. This standard midseason variety has proved a consistent yielder over a number of years, and the fact that it was entered by half the total number of competitors shows that it has the confidence of the leading wheat farmers of this State. Fifteen competitors planted the standard early variety "Gluyas Early."

The variety "Merredin" was planted by eight of the competitors, and the standard late variety "Yandilla King" by five. The variety "Gluyas Late" was planted by four, "Newman's Early" and "Hard Federation" by three, "Gresley" and "Onas" by two, "Ford," "Golden King," "Caliph," "Bald Early," "Gluclub," " Walker's," "Turvey" and "Federation" were grown by one each.

Time of Seeding.—The period during which the various crops were planted extended from the end of April to the first week in June.

The following table shows the times at which the crops in the various zones were planted:—

Zone.	Number of Competitors	Number of Competitors planting during—				
		End of April.	1st fortnight in May.	Middle of May.	Last fortnight in May.	Beginning of June.
No. 1	6	1	.	4	1	.
No. 2	10	1	3	5	1	...
No. 3	24	5	8	6	3	2
No. 4 .. .	12	3	3	6	..	.
No 5	28	8	11	2	7	.
No 6 . .	3	.	1		2	...
No 7	8	2	4	1	1	..
No. 8	9		3	2	3	1
Total .	100	20	33	26	18	3

77 of the Competitors planted during the month of May. Of these 59 planted during the period extending up to the middle of the month.

Where the area to be sown does not permit of the whole of the crop being planted in May, planting in April with suitable varieties is favoured rather than extending the seeding period into June.

Rates of Seeding.—The quantities of seed planted per acre varied from 33lbs. to 75lbs. The table hereunder shows the rates employed in the different zones:—

Zone.	Number of Competitors.	Number of Competitors using—			
		Under 45 lbs	45 lbs.	45-60 lbs.	Over 60 lbs
		per acre.	per acre	per acre	per acre.
1 .	6		1	5	
2	10	.	2	8	.
3 . ..	24	1	6	14	3
4 ..	12	3	7	2	
5	28		15	13	
6	3	1		2	
7 .	8			8	
8	9	1	2	4	2
Totals	100	6	33	56	5

The competitors in the later maturing districts favoured the heavier rates of seeding up to a bushel per acre being planted, while those in the earlier districts favoured a lesser amount.

Fertilisers.—The fertiliser applied by all competitors was superphosphate, the rates of application varying up to 175lbs. per acre. The average amount used by all competitors was 86lbs. per acre.

The table hereunder indicates the quantities and average amount used in each zone:—

Zone.	No. of Competitor	Number of Competitors using—						Unknown.	Average Rates in lbs. per acre.
		Under 60 lbs.	60 69 lbs.	70 79 lbs.	80-89 lbs.	90 99 lbs.	Over 100 lbs.		
		per acre	per acre.	per acre.	per acre.	per acre.	per acre.		
1	6	..	1	.	1	2	2	..	123
2	10	1	2	3	1	2	1	.	69
3	24	..	2	3	2	11	5	1	90
4	12	..	1	4	3	2	2	.	81
5	28	.	3	2	3	15	4	1	86
6	3		..	1	..	..	2	.	101
7	8	.	2		3	1	2	..	85
8	9	..	2	1	2	2	2	..	87
	100	1	13	14	15	35	20	2	86

Treatment of the Seed.—72 competitors graded the seed with which their competition crops were planted, 20 recleaned by means of a harvester, and eight planted ungraded seed. It is indicative of good farming methods that the majority of the competitors do not overlook the important operation of grading their seed.

The dry method of pickling seed wheat has gained favour with those who entered in these competitions, no less than 75 per cent. safeguarding their crops against ball smut by this method, while, of the remainder, nine used the wet methods of pickling. Of the 16 competitors who did not treat their seed, three considered that pickling their seed plots the previous year was sufficient.

Diseases.—Although reliable preventative methods are available for the prevention of the disease ball smut, there are still some farmers who are unable to prevent this disease.

In twelve of the crops inspected ball smut was present. The most of these were only slightly affected, but there was one instance where the crop was so affected as to cause serious loss both in yield and in market value of the grain harvested.

As mentioned before the crops inspected were, generally speaking, free from smut, although a few badly infected crops were noticed. The most popular method of treating the seed for the prevention of smut is the dry method with copper carbonate; when correctly applied this method is effective in preventing the disease, it also has the additional advantage that the seed can be treated immediately after harvest, and when treated the copper carbonate acts as a preventive against vermin. Although the majority of the competitors adopted the dry method, all of those who used it were not successful. The highly satisfactory results which many have obtained with this treatment indicate that failure with it is due to some defect in the methods of treating the seed. Effective results can only be obtained when the seed is dusted thoroughly with the powder. Those using the machines for treating the seed are sometimes inclined to treat the work as a "rush" job, and in consequence the grain is not covered as thoroughly as it should be.

The disease, Flag Smut, was noticed in several of the crops. It is more difficult to control than Ball Smut or Bunt, because the disease is transmitted through soil infection and distributed as a result of the spores on the foliage of the wheat plant being blown about. Fortunately, "Nabawa" is resistant to this disease, and to control this disease it is advisable to plant resistant varieties. As an additional precaution, and particularly when resistant varieties are not available or are unsuitable for the special climatic conditions, the land for the next crop should be fallowed in the early winter months—June and July—and all weed growth which may appear on the fallowed land destroyed either by sheep or by cultivation. It is also advisable, where possible, to grow a crop of oats between the two crops of wheat.

Some crops were also attacked by the disease "Take-all." Unfortunately, no variety as yet is known to be resistant to this disease, and its control, therefore, depends entirely on the farming practice adopted. Suitable methods for the control of "Take-all" are similar to those already recommended for the control of Flag Smut. In addition, planting as late as is safe in the sowing period is beneficial. Early fallowing and late sowing should, therefore, be the methods adopted to control this disease.

The spores of the disease "Rust" (*Puccinia graminis*) are present in the crops every year, but unless the climatic conditions are favourable it does not develop sufficiently to cause serious damage.

This year, however, the mild humid conditions which prevailed during the early part of October in some districts, particularly in the Northern and Great Southern portion of the Wheat Belt, favoured the development of this disease.

The control of this disease can only be attempted by planting the most resistant or escaping varieties. Both Nabawa and Gluyas Early are useful varieties for this purpose. The variety Yandilla King was considered rust resistant, but in view of the experience this year, it must be considered as a rust escaper.

Evidently in previous years when the conditions were favourable for the development of this disease, this variety was not at a stage of its growth when it was susceptible to the disease, and so escaped infection.

The Yields.—The desire to farm along secure and tried lines was very much in evidence. This, together with the favourable conditions throughout the Wheat Belt in 1927, has considerably raised the standard of competition crops. The average calculated yield for all crops inspected was 26.9 bushels against the average of 24.5 bushels the previous year.

The table hereunder shows the average calculated yields for the different zones.

Zones.	Number of Competitors.	Average calculated yield.
		bushels.
1	6	28·0
2	10	22·4
3	24	25·6
4	12	29·2
5 . .	28	26·2
6	3	29·0
7	8	25·6
8	9	32·0

The high calculated yields and the excellence of the majority of the wheat crops inspected is pleasing, and it is particularly desirable that the efforts of those who carefully prepared their land and seed in anticipation of the competition and of receiving a good crop generally will stimulate others to do likewise. Buoyed as we are by the wheat yield of 1927 we have still to remember that the test of efficient farming comes when our season is least favourable.

SUCCESSFUL CODLIN MOTH CONTROL IN WESTERN AUSTRALIA.

GEO. W. WICKENS,

Superintendent of Horticulture.

Western Australia, with an area of apples and pears aggregating 11,022 acres, is unique amongst the apple and pear producing countries of the world in the freedom of its orchards from one of the most destructive insect pests affecting pome fruits—Codlin Moth (*Carpocapsa pomonella*)—and this article is written to show, first, that this freedom is only attained by constant vigilance and effective action; and second, the need for a continuance of these protective measures.

In 25 years—1903 to 1928—there have been eleven outbreaks of Codlin Moth in Western Australia, and our fruitgrowing friends in the other States find it very difficult to believe that these outbreaks are each time really due to a fresh introduction of the pest from outside the State, and not to a natural spread of the insects within the State itself. But to anyone who is familiar with the habits of Codlin Moth and its ability to reproduce its species with great rapidity, it need only be stated that in spite of the fact of the eleven outbreaks quoted above over 99 per cent. of the area under apples and pears in Western Australia has never been affected from date of planting, and this could not be possible if the pest was continuously in the State for a period of 25 years.

In the various infestations which have occurred there have been two distinct features—those between 1903 and 1913, five in number, all occurring in city and town properties, four in Perth and one in Albany; and the remaining six from 1913 onwards all appearing in orchard districts.

The measure adopted in eradicating the pest at Perth was a destruction of the whole of the apples and pears as well as the trees in the infested area - the small value of these non-commercial places rendering total destruction the best method to adopt.

At Albany (also a non-commercial area) all pears and apples in the infested places were destroyed, and all large trees were cut back so hard that practically no fruit was borne by them the following year.

No recurrence of the pest has occurred in Albany since 1904 and none in Perth since 1913.

In season 1913-14 the first outbreak in a commercial orchard occurred at Katanning, and it was obvious in a country district (which although not one of the principal fruitgrowing areas of the State, nevertheless contained a fair number of orchards) that the destruction of all fruit liable to become infested together with the trees would not be reasonable if other measures of control could be adopted, and the ordinary routine practice of spraying, bandaging, attention to windfalls and destruction of infested fruit, etc., was carried out with entire success, the pest being stamped out of the district in the following season (1914-15), after two seasons' treatment, and it has not been seen at Katanning nor within 50 miles of there since that time.

In season 1915-16 Codlin Moth made its appearance at Bridgetown in a commercial orchard 30 acres in extent, in the centre of one of the best apple districts in the State. This outbreak had a greater potentiality for mischief than any that have occurred up to the present time, for within a radius of three miles from the infested place there were 1,100 acres of orchards, mostly apples, and the planted area near Bridgetown has been greatly increased since then. Fortunately, the pest was discovered before it had time to spread, and it was eradicated in one season by the same methods as those employed at Katanning, and no trace of the pest has been seen in the Bridgetown district nor within 50 miles of there since that time.

The unwelcome visitor next made its presence known in an orchard at Caversham in season 1918-19. This time the pest had chosen for its home the centre of the principal vineyard area of the State where apples and pears are only grown in small quantities as side lines; it was stamped out by spraying, etc., in that and the following season, and has not been seen within 50 miles of that district since.

The next outbreak occurred at North Dandalup in season 1924-25—a period of six years since the last appearance—and again the good fortune was experienced of discovering it before it had spread to more than one orchard, and it was stamped out by the usual treatment during that and the following season, and has not since been seen within 50 miles of North Dandalup. The reason for specially mentioning 50 miles in each of the instances quoted above is to show, if further proof were needed, that these various infestations are fresh introductions, and are not the result of the pest spreading outward from an infested area within the State.

In December of 1925 the most violent infestation, so far as numbers are concerned, was discovered at Collie in small gardens planted around residences in the town. It is no exaggeration to state that caterpillars of Codlin Moths were present in thousands, some heavily laden apple trees carrying scarcely one non infested fruit or fruit from which a caterpiller had not emerged, even Japanese plums were found to be infested.

Within the town boundary there are approximately 300 of these small places, 81 of which were infested. Outside the town boundary, but within three miles of the town, there are approximately 50 more places planted with fruit trees, 20 being semi-commercial orchards, ranging from two to seven acres in extent, and three of these were infested. Outside these again there are commercial orchards a few miles apart until the thickly planted orchard district at Preston is reached. Under these circumstances it was apparent that destruction of fruit and trees would not be the best method of dealing with the pest in Collie, for this action might easily lead to driving the moths, when they emerged from the pupae stage, further afield to find a suitable place to deposit their eggs, for, as stated above, many larvae had left the fruits before the pest was discovered, and obviously these could not be destroyed by destruction of fruit and trees.

The fact that the fruit and trees were not destroyed is specially mentioned here because a deputation comprising some of the principal apple growers of the State waited upon the Hon. Premier, Mr. Collier, and requested that as the pest had appeared mainly in what are known as "backyard gardens" so close to some of the principal apple districts of the State, the only safe treatment was to destroy both fruit and trees.

In connection with the request preferred by the deputation two things are worthy of note. The first is that when the departmental viewpoint was placed before the growers they showed such confidence in the judgment of the officers concerned that not a single further protest was raised. The second point is that the officers concerned were sufficiently confident of their ability to handle the outbreak without resorting to devastation, and also that devastation was not the safe method under existing conditions, that they were prepared to take the risk of the obloquy attached to failure. For it can be readily understood if failure had resulted, and the pest had obtained a permanent footing, the opinion would have been strongly held, and freely expressed, that if the Department had taken advice given by growers the pest would have been stamped out.

It will be of interest to mention here the steps taken by the Department to eradicate the pest in the Collie district and so that an understanding may be gained of the powers provided to deal with such matters, two sections of the "Plant Diseases Act"—one providing for instances when disease is found, and the other to prevent the spread of disease even though no disease is actually present—are quoted, as follow:—

Section 10 :

(1) Whenever an inspector is satisfied that disease exists on any orchard, land or premises, he may by requisition to the owner and occupier or either of them require them or him to do whatever is necessary in order to eradicate such disease from such orchard, land or premises, and to prevent the spread thereof, and the requisition may specify any particular steps which the inspector requires to be taken.

(2) Such requisition may name a time by which the doing of anything thereby required shall be commenced and a time within which it shall be completed.

(3) The owner and occupier, jointly or severally, or the owner or occupier, as the case may be, shall be responsible for due compliance with the requisition, and shall do everything thereby required to be done.

Penalty: One hundred pounds.

(4) In case of any default in compliance with the terms of the requisition, any inspector may do or cause to be done all such things as may be necessary in order to carry the terms of the requisition completely into effect, and the expenses incurred in and about so doing shall be recoverable from the person or persons guilty of the default.

Section 14 :

(1) An inspector may, with the approval of and subject to an appeal to the Minister, serve on the occupier and owner of any orchard or place where any plant is growing, or on either of them, a notice requiring them or him to take any measures or do any acts which the Inspector may deem necessary to prevent the spread of any disease, and in such case, even although the orchard or place is not infected, any person on whom any such notice is served shall, as soon as practicable after the receipt thereof comply with the requisitions thereof.

(2) In the event of notice being served on both the owner and occupier, they shall be jointly and severally liable to perform the requisitions thereof.

(3) In case of any default in compliance with the terms of the notice any inspector may do or cause to be done all such things as may be necessary in order to carry the terms of the notice completely into effect, and the expenses incurred in or about so doing shall be recoverable from the person or persons guilty of the default.

An area within a circle having its centre at the Collie Post Office, and a radius of three miles, was taken under departmental control. All the necessary work, spraying, bandaging, etc., in the small places in the town was carried out departmentally, and notices of instructions were issued to those outside the town boundaries, who, whether their orchards were infested or not, were obliged to carry out the work at their own expense.

As these notices show the procedure adopted for stamping out the pest a copy of the one issued to occupiers of infested orchards is here quoted, and the only difference between it ana the one issued to occupiers of non-infested orchards is the enforcement of five sprayings in the former case and four sprayings in the latter

DIRECTIONS FOR TREATMENT.

"All apple, pear and quince trees must be sprayed five times with Arsenate of Lead, using 3lbs. Arsenate of Lead paste or 1½lbs. Arsenate of Lead powder in 50 gallons of water.

The first spraying must be applied just when the petals of the blossoms commence falling.

The second spraying must be applied 1(to 12 days after the first spraying.

The third spraying must be applied 14 days after the second spraying.

The fourth spraying must be applied six weeks after the third spraying.

Fifth spraying must be applied fourteen days after the fourth spraying.

All loose bark must be scraped from off the trunks of all apple, pear, and quince trees.

The trunks of all apple, pear and quince trees must be bandaged with strips of bagging or other suitable material six inches in width. After 1st November these bandages must be taken off and examined once every ten days, replacing bandages immediately after examination. All larvae of Codlin Moth found in the bandages and upon trunks of trees underneath the bandages must be destroyed.

All fallen fruit must be picked up daily and all infected fruit must be boiled.

The land in the orchard must be kept well cultivated and free from all rubbish and weeds.

Before any fruit leaves the orchard it must be examined and passed by an Inspector and must be sent only to destinations approved by him."

It will be noted from the date of the discovery of the pest (December, 1925) the season at that time was too far advanced for effective spraying during the season of 1925-26, and though the area was sprayed and bandaging, etc., was carefully carried out, it was not until the following season 1926-27 that a thorough campaign of destruction could be inaugurated.

In that season five sprayings with Arsenate of Lead (powder form) were applied from September to December inclusive, using at the rate of 1½lbs. in 50 gallons of water. Hundreds of eggs were to be seen at time of spraying, and many minute poisoned larvae were observed.

In the season of 1925-26 the larvae caught in the bandages and destroyed when found were far too numerous to be counted. In season 1926-27 in the town area the total number of fully developed larvae found during the whole season only amounted to 30 and the infested places had been reduced from 81 to 13. In the small places and semi-commercial orchards outside the town boundary 53 adult larvae were found during the season.

In the present season 1927-28 exactly the same procedure as last season has been followed and at time of writing, 11th February, 1928, not a single larva has been found in the town; the number of infested places in the whole area has been reduced to one; and in this a weekly search of fruit and bandages has resulted in finding only 13 codlin caterpillar to date.

It will be seen from the above that though the pest is still present in Collie its end is in sight.

In 1926 another outbreak, but much less severe, and the last to date, was discovered at Narrogin. The same procedure as at Collie has been adopted and the number of infested places has been reduced from nine in 1926-27 season to two in 1927-28, and the total number of codlin larvae found in the latter season up to the present, 11th February, 1928, only amounts to 29.

It would be hardly fitting to conclude this article without some reference to what is meant in a saving of actual cash to the State of Western Australia by the absence of Codlin Moth from the orchards. If the pest were prevalent the same as it is in the Eastern States, five sprayings would be needed annually, and as our apples are not affected with Scab (*Venturia inequalis*) the spraying would have to be carried out for codlin alone, and not as in the East where some dual purpose sprayings are applied at one time for scab and codlin, so the cost would be attributable to one pest only.

In addition to spraying, all apple and pear trees would have to be bandaged and these bandages regularly examined throughout the season.

All fallen fruit would have to be gathered from the ground at frequent intervals and all infested fruit destroyed by boiling.

A conservative estimate for spraying five times in a season, with the extra work outlined above, is £4 per acre per annum.

The area under bearing apple trees in Western Australia amounts to 7,496 acres, and this would mean at £4 per acre an annual cost of £29,984.

Pears are omitted from this estimate because scab (*Venturia pyrina*) affects this class of fruit in Western Australia, and some of the necessary codlin sprays could be applied at the same time as those now carried out for the control of scab, but an added cost would be incurred in the purchase of arsenate of lead, and in the extra sprayings necessary to control codlin over those used in this State against Pear Scab.

In addition to the actual outlay mentioned above the loss due to infested fruit must also be taken into account. The average annual crop of apples in Western Australia approximates 650,000 cases, and the average annual crop of pears 88,000—a total of 738,000 cases. In countries where codlin moth has made a permanent home control measures which result in 90 per cent of clean fruit are looked upon as good; 95 per cent. is considered excellent and rarely attained. Assuming that Western Australia would achieve the higher result, the loss due to infested fruit would amount to 5 per cent. of 738,000 cases, or 36,900 cases annually. These at 7s. 6d. per case would mean a monetary loss to the State in round figures of £13,900.

The direct annual loss, therefore, from money expended in control measures plus the loss due to infested fruit, would amount to £43,784 without taking into consideration the expenditure incurred in treating pears.

It is worthy of note that the sum mentioned would be sufficient to pay all expenses now incurred in connection with the Fruit Branch of the Agricultural Department for a period of six years.

The earlier portion of this article has shown the necessity for vigilance and efficiency; the latter demonstrates the losses to be expected if codlin becomes permanently established in the apple and pear orchards of the State; there is a reason for stressing the possible loss at the present time and it is this:—Western Australia will harvest in 1928 the lightest apple crop produced for many years past, one that perhaps will not be much in excess of the quantity required for use within the State. This may mean that later in the season if apples become dear in the retail shops and barrows the general purchasing public who are not fully cognisant of the full details of the case may agitate for the introduction of apples from the Eastern States, where a bumper crop is being gathered, and which both Commonwealth and State Regulations at present prohibit from being sent to Western Australia.

A perusal of the above will surely convince any genuine West Australian of the wisdom of continuing the prohibition now in force.

This article would not be complete without paying a tribute to the great assistance rendered by growers to the Department in a combined effort to keep the State free. Though the instructions have often been both irksome to receive and expensive to carry out, a ready response has always been forthcoming, and not only this, but the growers have done inestimable service in notifying the Department of the presence of the pest—Collie, Narrogin, and North Dandalup all fall within that category, and it is only this happy combination of growers and officers that has made it possible to head this article "Successful" after experiences covering a quarter of a century.

"THE JOURNAL OF AGRICULTURE"

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SPOTTED WILT OF TOMATOES.

W. M. CARNE, F.L.S.,
Botanist and Plant Pathologist.

This disease is the principal bane of tomato growers in this State, especially in the spring and early summer crops. In many districts, both here and in New South Wales, Victoria, and South Australia, it is almost impossible in some years to raise commercial spring-sown crops in the open. Fortunately in this State the Geraldton area is relatively free.

The names Wilt and Blight given to this disease in this State are misleading. There are several other wilt diseases, the most common being one which occurs in the summer and is caused by a fungus attacking the bases of the stems. It may be recognised by the lower leaves turning yellow, becoming brittle and folding upward. The term Blight is applied to many diseases.

In Spotted Wilt the disease appears as dark, bronzy markings on the surfaces of the youngest leaves. Affected leaves finally die. The stems may develop dark streaky marks. The fruits either fail to develop properly or ripen in a more or less mottled fashion.

It has for some time been evident that Spotted Wilt probably belonged to the virus group of diseases. In diseases of this type an infective principle (which is not recognisable microscopically) is carried in the plant juices. Insects are the main cause of the transmission of a virus from an infected plant to a healthy one. They are usually small and feed by sucking the plant juices. Experiments in Victoria and New South Wales supported the idea that the disease was caused by a virus. In 1927 this was definitely confirmed at the Waite Agricultural Research Institute in South Australia. Working under the auspices of the Council of Scientific and Industrial Research, Mr. H. A. Pittman, B.Sc.Agr., demonstrated that Spotted Wilt was a virus disease conveyed from plant to plant by the common thrips (*Thrips tabaci*). He also confirmed the finding of other workers that there is no evidence of infection being carried in pruning or in the seed or soil. The disease appears some sixteen to twenty days after the plants are infected by the thrips. It is not known to attack other than tomato plants.

Control.

Up to the present no definitely satisfactory methods for controlling Spotted Wilt are available for tomato crops grown in the open.

The following recommendations are made on general principles:—

1. At least one month should elapse each year during which no tomato crops are alive on any area. All old plants should be removed and burnt. The object is to remove any chance of infected plants of the summer crop becoming sources of infection in the spring crop or *vice versa.*

2. Destroy infected plants as soon as detected. Owing to the disease taking sixteen to twenty days to become apparent, it is evident that the destruction of infected plants is not to be relied upon as an effective measure.

3. Save the seed of apparently resistent plants. Many disappointments may arise from sowing the seed of such plants. However, the small egg and cherry tomatoes are very resistant and there is always the possibility of finding better plants which transmit their resistance to their offspring. A tomato of good commercial qualities and resistant to this disease would be of outstanding value.

DISTRICT CROP COMPETITION—YILGARN AREA.

Judge: G. K. STEVENS, Manager, Yilgarn Expt. Farm.

Arising from a suggestion of the Director of Agriculture on the occasion of his visit to that area during July, 1927, the West Bullfinch Primary Producers' Association organised a crop competition amongst the Associations of the adjoining areas in the Yilgarn district. Except that the areas of the competing crops were each ten acres and the crops on unfallowed land were eligible to compete, the conditions governing the competition were similar to those governing the Royal Agricultural Society crop competitions. Three Associations were represented, namely, those of West Bullfinch, North-East Bullfinch, and Corinthia.

This is the first competition of its kind conducted in this area, and it was pleasing to note the enthusiasm and friendly rivalry among the competitors. The West Bullfinch Association is to be congratulated on its organising such a successful competition.

W. Bamber's Winning Crop of Gluyas Early.

A perusal of the tabulated awards made will indicate the high standard obtained in all these districts.

WEST BULLFINCH CROP COMPETITION.—(10 ACRES)

Judge. G. K. Stevens, Manager, Yilgarn Experiment Farm

Competitor.	Variety.	Yield. 40 points.	Freedom from Weeds. 20 points.	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points.	Evenness of growth. 10 points.	Total. 100 points.
Bamber, W.	Gluyas Early	35	17	14	12	8	86
Cass-Smith, W. P.	Gluyas Early	33	18	13	13	8	85
Copley, C.	Gluyas Early	33	18	13	12	8	84
Berrey, W.	Gluyas Early	33	18	14	12	7	84
Copley, T. B.	Gluyas Early	31	18	13	12	9	83
Davies, C. R.	Nabawa	32	18	13	11	7	81
Bacon, W.	Nabawa	32	18	13	11	7	81
Yule, G.	Gluyas Early	33	17	11	11	9	81
Jukes, J.	Gluyas Early	30	18	14	11	7	80
Godfrey, F. H.	Gluyas Early	29	18	14	11	8	80
Duncan, R.	Nabawa	26	18	13	13	8	78
Jukes, J.	Gresley	27	18	12	12	7	76

NORTH-EAST BULLFINCH CROP COMPETITION—(10 ACRES)

Judge G. K. Stevens, Manager, Yilgarn Experiment Farm.

Competitor.	Variety.	Yield. 40 points.	Freedom from Weeds. 20 points.	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points.	Evenness of growth. 10 points.	Total. 100 points.
Chapman, H.	Gluyas Early	37	18	14	14	9	92
Mann, J.	Gluyas Early	29	16	14	14	9	82
Reynolds, H.	Gluyas Early	27	17	14	13	8	79
Cox, H. C	Gluyas Early	29	18	12	12	8	79
Kelly, R.	Nabawa	25	16	14	14	8	77
Southern & Clayton		25	18	14	12	8	77
Mann, J.	Nabawa	28	15	13	12	7	75
Hoffmann, O. A.	Gluyas Late	26	16	14	12	7	75
Hoffmann, O. B.	Gluyas Late	23	17	14	13	8	75

W. P. Cass Smith's competing crop, West Bullfinch (Gluyas Early).

CORINTHIAN CROP COMPETITION—(10 ACRES)

Judge: G. K. Stevens, Manager, Yilgarn Experiment Farm

Competitor.	Variety.	Yield 40 points	Freedom from Weeds. 20 points.	Freedom from Disease. 15 points.	Freedom from Admixture. 15 points.	Evenness of growth. 10 points.	Total. 100 points.
Leckey, J.	Gluyas Early	35	17	13	12	9	86
Davies, F. & J.	Gluyas Early	32	18	14	13	8	85
McKay, D.	Gluyas Early	32	17	12	13	8	82
Stopher, R	Gluyas Early	26	16	14	12	8	76

INTERDISTRICT 10 ACRES CROP COMPETITION—BULLFINCH AREA

Representatives from District Crop Competitions.

Competitor.	District.	Variety.	Yield. 40 points.	Freedom from weeds 20 points	Freedom from Disease. 15 points	Freedom from Admixture 15 points.	Evenness of growth. 10 points.	Total 100 points.
Chapman, H.	N.E Bullfinch	Gluyas Early	37	18	14	14	9	92
Bamber, W. ...	West Bullfinch	Gluyas Early	35	17	14	12	8	86
Lecky, J. ...	Corinthian ..	Gluyas Early	35	17	13	12	9	86
Cass-Smith, W. P.	West Bullfinch	Gluyas Early	33	18	13	13	8	85
Davies, F. & J.	Corinthian	Gluyas Early	32	18	14	13	8	85
Mann, J. J. ..	N.E. Bullfinch	Gluyas Early	29	16	14	14	9	82

The excellent season experienced no doubt was responsible to a large extent for the high yields, some of the crops being calculated to yield up to 36 bushels per acre. Although pioneering methods were generally adopted by the competitors, credit must be given for the thorough manner in which the various operations were carried out. It is to be hoped that the results obtained this year will not mislead those interested and cause them to overlook the experience of the previous two years, and that the successful production of wheat depends on the employment of up-to-date methods.

As mentioned above all the crops were of a high standard, the winning crop of Mr. H. C. Chapman being particularly creditable. This was part of 70 acres of Gluyas Early planted on fallow during the third week in May. The land was prepared by being ploughed with a Sundercut plough during the previous August to a depth of 3 inches. This was springtyne cultivated before seeding after the March rains and planted with a combined cultivating drill crossing the previous cultivation. It was sown at the rate of 40lbs. of ungraded seed to the acre with an equal amount of superphosphate.

The crop was even in height and well stooled, the heads being uniform, large and well filled; the crop judged showed remarkable freedom from weeds, disease and admixture. The seed was from a crop sown the previous year with seed from the Merredin Experiment Farm.

Other crops worthy of note were those of Messrs. Cass-Smith, Bamber, Copley, Yule, Berry, and F. & J. Davies, all of the variety Gluyas Early. That of Mr. Bamber lost points due to spaces missed with the drill when planting and that of Mr. Yule owing to the amount of ball smut present. The crops, generally, were fairly free from disease. Traces of Septoria, however, were noticed, and in three crops only was the disease ball smut noticed. The presence of this latter disease is not excusable, as the up-to-date dry method now available for its prevention is reliable and convenient.

The cultural details, together with the rainfall for 1927 as officially recorded at Bullfinch and West Bullfinch, are set out hereunder:—

District.	Jan.	Feb.	March.	April.	Growing Period.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Bullfinch ...	19	45	625	62	113	210	174	108	315	23	943	22	20	1,736
West Bullfinch ...	3	33	638	48	90	194	209	85	304	37	919	11	23	1,675

WEST BULLFINCH CROP COMPETITION.

Competitor	Cass Smith	Davies, C. R.	Bacon, W	Godfrey, F. H.	Duncan, R.	Bamber, W.
Years cropped fallowed	New land	New land	New land	New land	Second crop	New land
Timber ..	Gimlet and Salmon	Gimlet and Salmon	Salmon and Gimlet	Salmon, Gimlet, Mallee,	Salmon, Gimlet, Morrell	Salmon and Gimlet
Ploughed ...	Nil Cultivated	Nil	Nil	Nil	Nil	Nil
Type of Plough	..				.	...
Depth ...	...	..			..	...
Condition of land at time of ploughing		..	.		.	...
Other cultivations	First after 6in rain in Mar. 2nd after 50 points in May Drilled with combine	One cultivation previous to seeding with a combine	One cultivation previous to seeding with a combine.	One cultivation previous to seeding with a combine	Cultivated in April, drilled with a combine	One cultivation before seeding with a combine
Variety .	Gluyas Early	Nabawa	Nabawa	Gluyas Early	Nabawa	Gluyas Early
Planted .	May 16th	May 1st	May 4th	May 10th	April 21st	.
Rate of Seed	30lbs	30lbs	30lbs	30lbs	27lbs	33lbs.
Graded	Yes	Yes	Yes	Yes	Yes	No
Treated	Dry pickled	Dry pickled	Dry pickled	Dry pickled	Dry pickled	Dry pickled
Rate of Super	52lbs	60lbs	60lbs	50lbs	60lbs	42lbs
Disease	Trace of rust	Trace of rust	Trace of rust	Nil	Septoria	Nil

Competitor	T. N Copley.	C. Copley.	G. Yule.	F. Berrey	J. Jukes	J Jukes.
Years cropped fallowed	Second crop	New land	Second crop	New land	New land	New land
Timber	Salmon and Gimlet	Salmon, Gimlet, Morrell	Salmon and Gimlet	Salmon and Gimlet	Tamar Scrub, Mallee	Salmon, Gimlet, Morrell
Ploughed	..	..			.	.
Type of Plough	.	.			...	.
Depth ..	...		.	.	.	..
Condition of land at time of ploughing ing		..		.	.	.
Other cultivations	Cultivated in Mar., seeded with combine	Cultivated 1st Apl., seeded with combine	Cultivated in Mar., also in Apl. Seeded with combine	Cultivated in Mar., seeded with combine	Cultivated in Apl., seeded with combine	Cultivated in Apl., seeded with combine
Variety ..	Gluyas Early	Gluyas Early	Gluyas Early	Gluyas Early	Gluyas Early	Gresley
Planted ...	May 10th	May 17th	April 28th	May 24th	May 10th	May 14th
Rate of Seed	30lbs.	30lbs.	40 to 45lbs	33lbs.	30lbs.	26lbs.
Graded ..	Yes	Yes	Yes	Yes	Yes	Yes
Treated ..	Dry pickled	Dry pickled	Dry pickled	Dry pickled	Dry pickled	Dry pickled
Rate of Super	50lbs.	45lbs.	80 to 90lbs	43lbs	60lbs	45lbs.
Disease ..	Trace of Rust	Septoria	Smut and Trace of Rust	Nil	Nil	Trace of Rust; Septoria most pronounced

N E. BULLFINCH CROP COMPETITION.

Competitor	M. Reynolds	N. Cox.	H. Chapman.
Years cropped fallowed. .	New land	New land	First Crop
Timber	Jam and Gimlet	Jam and Gimlet	Salmon and Gimlet
Ploughed	...	. .	Yes—August
Type of Plough	. .	..	Sundercut
Depth	...	.	3 inches
Condition of land at time of ploughing	..		Good
Other Cultivations	Cultivated before seeding and crossed with combine	Drilled with Sunder seeder	Fallowed in August cultivated before seeding and cross drilled with combine
Variety	Gluyas Early	Gluyas Early	Gluyas Early
Planted	June 3rd	May 10th	May 17th
Rate of Seed	38lbs.	33lbs	40lbs.
Graded . .	No	No	No
Treated	Dry Pickled	Dry Pickled	Dry Pickled
Rate of Super .	40lbs.	53lbs.	40lbs.
Disease . .	Nil	Trace, Smut and Rust	Nil

Competitor	J. Mann	J. Mann.	R. Kelly.	O. A. Hoffmann	O B. Hoffmann.	Southern & Clayton.
Years cropped Years fallowed	2nd Crop 1st year in July	2nd Crop .	New land ..	New land ...	New land ...	. .
Timber ...	Salmon, Gimlet, and Morrell	Salmon, Gimlet and Morrell	Salmon and Gimlet	Salmon and Gimlet	Salmon, Gimlet, and Morrell	..
Ploughed .	Yes	Yes	.	.	..	...
Type of Plough	Disc	Disc	...	...	.	..
Depth ...	3½ in.	2in.	..	...	.	...
Condition of land at time of ploughing	Good	Good	...	..	.	
Other cultivations	1. October ; 2. Before seeding	Ploughed before seeding	Seeded with Combino	Disc harrowed before seeding	Disc harrowed before seeding	...
Variety . .	Nabawa	Gluyas Early	Nabawa	Gluyas Late	Gluyas Late	...
Planted ...	May 10	May 22	May 4	May 7	May 1	...
Rate of Seed ...	29lbs.	34lbs.	26lbs.	26lbs.	26lbs.	...
Graded ...	No	Yes	No	Yes	Yes	...
Treated ...	Dry Pickled	Dry Pickled	Dry Pickled	Dry Pickled	Dry Pickled	...
Rate of Super.	45lbs.	45lbs.	30lbs.	45lbs.	45lbs.	...
Disease ...	Septoria	Nil	Nil	Nil	Nil	...

CORINTHIAN CROP COMPETITION.

Competitor.	R. Stopher.	F. J. Davies.	J. Lockey	McKay, D.
Years cropped ..	New land	New land	Second Crop	...
Timber	Salmon and Gimlet	Gimlet	Salmon and Gimlet	...
Ploughed . .	...		.	...
Type of Plough ..	..		..	...
Depth	...	.		
Condition of land at time of ploughing				
Other Cultivations	Drilled with Combine	Drilled with Combine	Drilled with Combine	...
Variety	Gluyas Early	Gluyas Early	Gluyas Early	Gluyas Early
Planted . .	May 10th	May 27th	April 27th	May 17th
Rate of Seed .	36lbs.	34lbs	30lbs.	34lbs.
Graded	No	No	Yes	No
Treated ..	Wet pickled	Dry pickled	Dry pickled	Wet pickled
Rate of Super .	60lbs.	80lbs.	45lbs.	44lbs.
Disease .	Nil	Nil	Septoria	Smut

THE ORIGIN OF "NABAWA" WHEAT.

(GEO. L. SUTTON, Director of Agriculture.)

" Nabawa " is the result of a selection made at the Chapman Experiment Farm, following upon the crossing of two varieties of wheat—" Gluyas Early " and " Bunyip." The initial step in connection with the production of " Nabawa," namely, the crossing of these two varieties, was carried out at the Wagga Experiment Farm, New South Wales, by Mr. H. J. Hurst, who was then my assistant, when I held the position of Wheat Experimentalist in N.S.W., and was in charge of the wheat breeding work at the Wagga and other experiment farms in that State. The cross was made in 1907. When I was appointed Commissioner for the Wheat Belt in this State, I brought with me a number of unfixed crossbreds, including several strains of the cross referred to. These were planted at the Narrogin School of Agriculture and the Merredin and Chapman Experiment Farms in 1912. The work of making the selections, which resulted in the production of the fixed type eventually called " Nabawa," was carried out by Mr. Charles Orchard, Seedsman at the Chapman Experiment Farm.

As is now well-known, the making of a cross is not all that is necessary in the production of a new variety. The object of crossing two old varieties in order to secure a new and better one is to bring about variation so as to permit the plant breeders to carry out the selection in the desired direction. The making of the cross is, therefore, the initial stage only in connection with the production of a new variety. As the result of a cross, great variation is often experienced, and from the same cross the selector can very often secure several varieties with characteristics differing entirely from their parents and from each other. "Nabawa" is an apt illustration of this latter, for "Gluyas Early," its mother parent, is an early variety, whilst "Bunyip," its sire, is even earlier, but "Nabawa" is a mid-season variety, later than "Gluyas Early" and considerably later than "Bunyip."

It is reported that in New South Wales a strain of the same cross was fixed, but after the usual trials it was abandoned because it was a poor yielder, and it had no other special characteristics to recommend it. It was evidently quite different to "Nabawa."

At the Chapman Experiment Farm a selection from one of the strains brought from New South Wales showed a remarkable freedom from rust, whilst other varieties, particularly "Federation," which was very popular at that time, were badly attacked. This particular strain was developed, and in 1915 it was found that the desired qualities were fixed and it was then named "Nabawa" after the district in which it was produced.

The strain which was selected in Western Australia and from which was evolved "Nabawa" proved under Western Australian conditions to be either rust resistant or rust escaping, and in view of our lengthy experience now it is probably the former. It has also proved to be a variety of great productivity under many and varied conditions, and, from the reports which are being received from the Eastern States, particularly from New South Wales, it appears to be a good yielder under the same conditions as those under which another selection of the same cross proved to be a poor yielder.

Following the usual practice in this State, the new variety was subjected to severe trials for several years before being distributed to settlers: it was not until about 1919 that it was distributed in any quantity to farmers.

"Nabawa" was one of the first crossbreds fixed and named by the Agricultural Department of this State, and since then it has more than justified the promise which it gave when named, and, now, as is shown by the Government Statistician, it is the most popular variety in Western Australia, approximately half the wheat area in this State being cropped with it. Since its selection and fixing it has also proved to be so highly resistant to Flag Smut as tentatively to be regarded as immune.

From the reports in the Eastern States press the Western Australian strain of "Nabawa" is apparently proving very prolific there, and the fact that it is also resistant to Flag Smut makes it additionally valuable.

Recently it was learnt from Mr. E. C. Mitchell, Inspector of Aborigines, that the meaning of the aborginal word "Nabawa" is "fat yielder," and indicates wealth and abundance. By a happy accident this variety was given a name which foreshadowed its high yielding characteristics.

A FALLOW "SCRAPER."

L. J. H. TEAKLE,
Plant Nutrition Officer.

Although one might well hesitate before suggesting that the farmer use additional machinery under the present conditions of agricultural practice, I beg leave to describe very briefly an implement which has been used to good advantage in certain sections of California.

During a recent trip through part of the wheat belt of this State, I had occasion to visit some thirty farms and inspected the fallows entered for the Agricultural Societies' Competitions. The prevalence of a summer growing

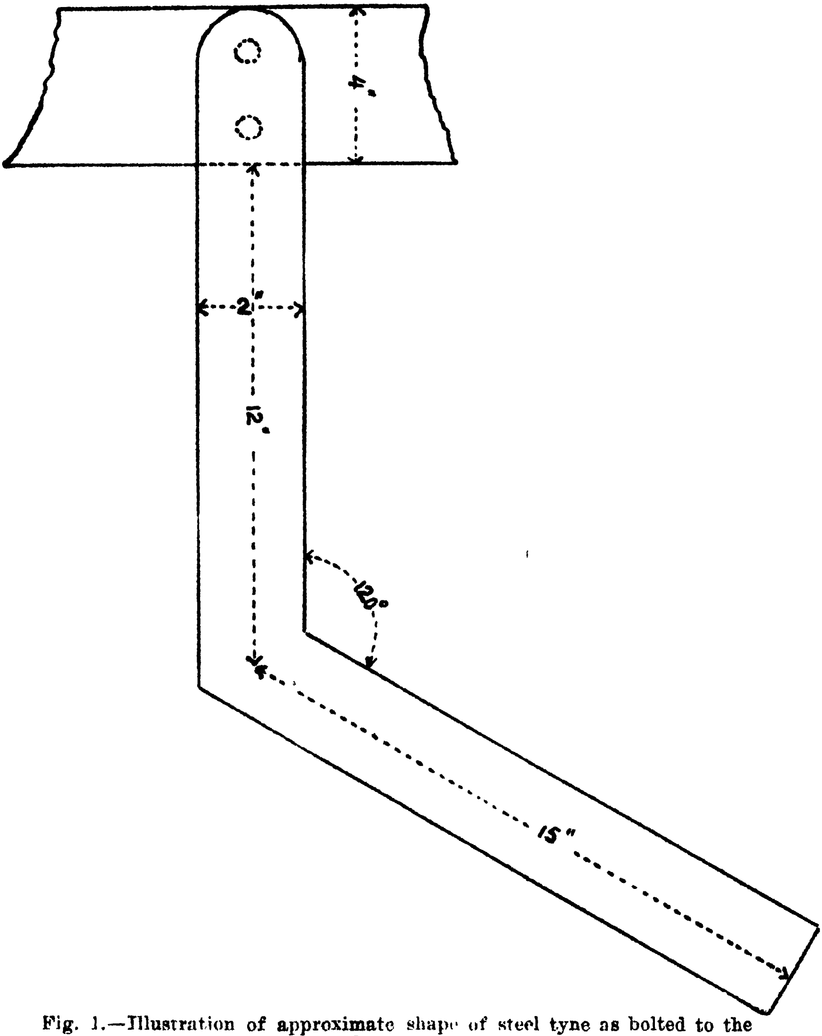

Fig. 1.—Illustration of approximate shape of steel tyne as bolted to the cross bar. Scale 3in. = 1 foot.

weed, Solanum hoplopetalum (known locally under various names such as California Thistle and Summer Thistle), was particularly noticeable, and a few test holes made with the aid of a soil auger showed that it was a moisture robber. The aerial portions of this weed are easily knocked off the root, and now is the time to deal with a potential pest which may spread throughout the wheat belt in the course of a few years. A few "paddy" melons are to be seen on some holdings, and this curse of the Eastern States of Australia should be summarily dealt with.

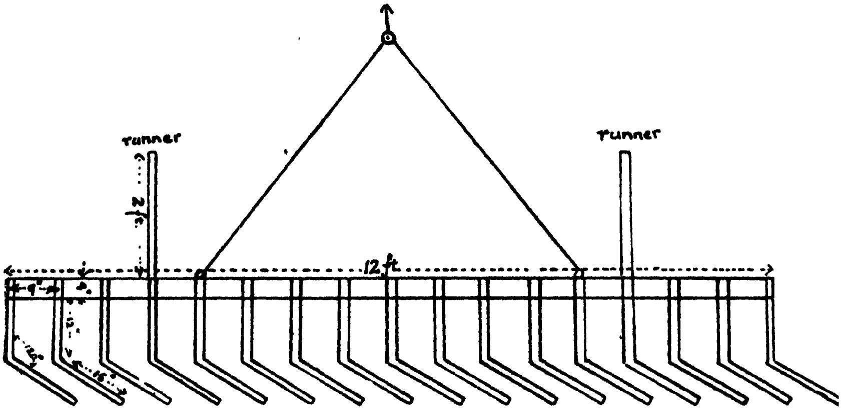

Fig. 2.—Illustration of general scheme used in the California scraper. Scale ½in. = 1 foot.

The Eastern States farmer uses a "scraper" for this purpose, and I am taking the liberty of suggesting an implement which may be of use in Western Australia for dealing with the weeds mentioned, and perhaps in other States.

A brief description of the California implement is as follows:—

A 2-inch by 4-inch pole about 12 feet long is taken and marked off at suitable points, say about 9 inches apart. At these points are bolted steel tynes, shaped as in the diagram, Fig. 1. These tynes should be about 2¼ feet long, 1¾ to 2 inches wide, and ¼ to ⅜ inch thick. They are bent in the middle to an angle of 120 degrees and the front or cutting edge sharpened to decrease the draft. The cutting knife should be inclined downwards at about the angle of a ploughshare to cause it to draw itself slightly into the ground. The exact shape of the tynes for most efficient working will have to be determined by experiment, as the author was not able to get any measurements from the implement in the field. A couple of runners placed in front of the crossbar may improve the working of the implement and, if adjustable, enable the driver to regulate the depth of the scraper. The diagram in Fig. 2 will give some idea of the general nature of the scheme.

According to the efficient manner in which the scraper worked in a Californian orchard, it should be very useful in the treatment of summer weeds on fallow. It has the advantages of—

1. Being cheap;
2. Being light in draft;
3. Being made on the farm;
4. Skimming just under the surface without damaging the mulch or bringing up moist soil from below;

5. Not dragging weeds;
6. Being made any size desired.

Certain elaborations occurred to the author after some consideration of its use in Western Australia:—

(a) Equipment with three small wheels; two on the crossbar; one in front like a spring-tooth cultivator. The height of the crossbar, above the ground, could be adjusted by means of a crank axle. The depth of cut of the tynes could be regulated by means of the front wheel instead of runners as mentioned above.

(b) To cope with stones and stumps which are still numerous on many places the tynes could be hinged on the crossbar and held in position by means of a spring of proper strength. This idea is illustrated in Fig. 3.

(c) Where the ground is uneven, for instance due to the presence of crab holes. The implement could be easily made in sections of convenient size and a reasonable number of sections used as a unit.

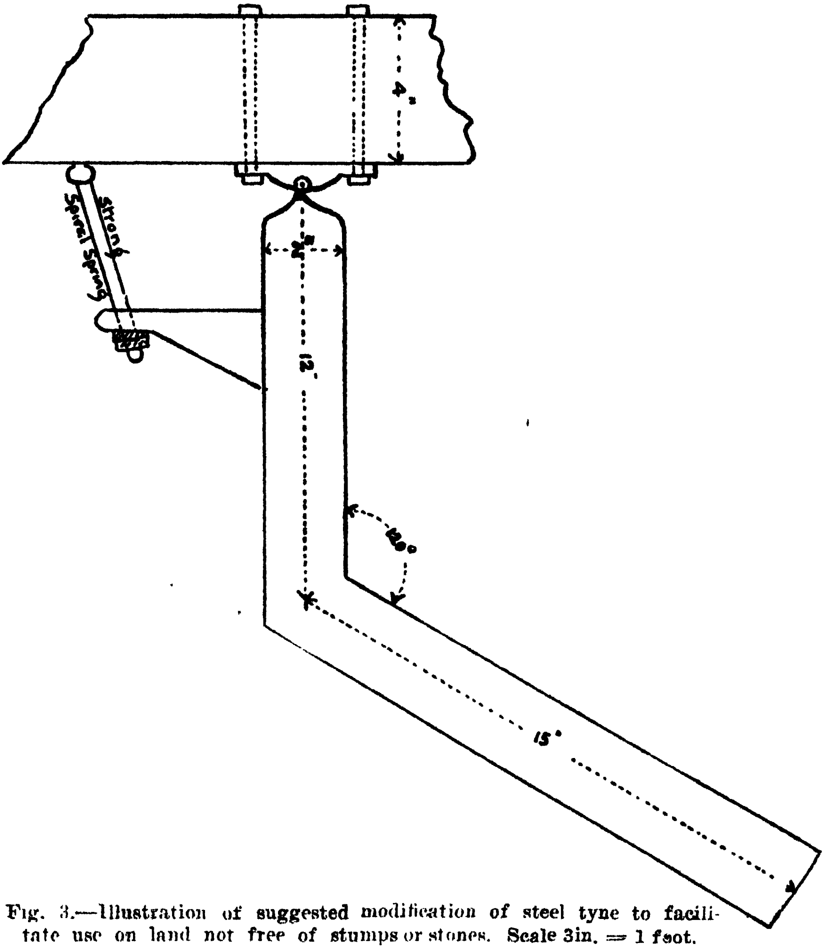

Fig. 3.—Illustration of suggested modification of steel tyne to facilitate use on land not free of stumps or stones. Scale 3in. = 1 foot.

HAND FEEDING OF SHEEP.

By HUGH MCCALLUM,
Sheep and Wool Inspector.

It is important when a dry spell occurs not to wait until the sheep have lost in condition and strength before beginning to hand feed. The weakness of a sheep that has been starved is reflected in all the internal organs, and such an animal is unable to assimilate the nourishment in the food that it ingests. It can easily be understood that there is more chance of keeping up the condition of a healthy sheep than of one with a constitution already weakened by lack of nourishment. Should hand-feeding be necessary it should be commenced whilst there is yet natural feed. One of the main factors of successful sheep raising is the feeding of the flock. "Feeding is half the breeding"—this applies more particularly to the unborn and the immature young. The good condition of the ewe when carrying and suckling the lamb is an important factor in the successful rearing of the offspring.

In hand feeding no one food is sufficient to keep up the animal's strength —a balanced ration is necessary. The feeding of grain alone, without the addition of some roughage, will be attended with disaster. On a farm this should be possible as every farmer should have on hand reserves—hay, straw, etc.—and these are of inestimable value in a dry season. Good licks are necessary for sheep in the dry season; they cost little and are of great benefit. A little food given daily will produce better results than larger amounts at irregular intervals.

Lambing ewes should be fed—if it is necessary to feed—*during the whole period of gestation*, not just towards the end as is usually the case with many sheep owners, to ensure that their offspring are endowed with the best constitution possible and the fullest powers of production and reproduction. Too many lambs are lost through neglect in our State. This should not occur if more attention were given to detail. Every successful lambing is the means of building up our flocks, both in numbers and constitution, and of increasing our wool clip in weight and quality.

The weaker sheep should be fed away from the remainder of the flock: under ordinary conditions the stronger sheep get more feed than the weak. This is often the case when troughing is used. If the food is fed from the ground it should be scattered in such a way as to give all the sheep an equal chance at feeding time, as in many instances the poorer sheep are robbed of their ration.

Lambing ewes, as they drop their lambs, should be placed in a separate paddock where they will not be hindered by the lambs from obtaining their food. If this is not done the ewes either lose their ration or forsake their lambs in order to get their food. Many of the pastures upon which ewes in lamb and rearing lambs have to exist are utterly inadequate for a successful lambing—they are what is known as "sheep sick." If changed from paddock to paddock the sheep will do better than on one pasture all the time. It is imperative that, if the breeding ewes are to produce and rear healthy lambs and produce a good clip of wool, they should be well fed.

After the first rains have fallen and the green feed begins to shoot, hand feeding should not be discontinued immediately, as the grass and herbage does not contain very much nutriment. Very often big losses occur after the change of weather through the discontinuance of hand feeding. This should be gradually reduced as the natural feed increases in feeding content.

Many sheep farmers to-day have no reserves of feed. This should not be considering the good seasons we have enjoyed. The growing of fodders would enable the land to carry more sheep and also add value to it. On no account should pastures be over-stocked as they will then be eaten right out and have to be re-established.

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1—4

BEEKEEPING NOTES.

H. WILLOUGHBY LANCE,
Apiculturist.

During my summer tour of inspection, I have noticed that many small beekeepers make the mistake of having a large number of weak or medium hives, instead of a few good strong ones, and count their wealth by the number of swarms they catch each spring rather than by the honey produced.

The experienced beekeeper of to-day aims at having a few strong colonies in good frame hives instead of many weak ones in half rotten boxes or even in frame hives.

The work entailed in manipulating six strong frame hives is much less than that of twelve weak ones, and the honey yield is usually as great, in the case of frame hives, and 100 per cent. more than box hives. Then again the losses due to the moth pest are negligible with strong hives and good queens. If a beekeeper is in the habit of keeping his hives strong, he will the sooner detect foul brood without losing his bees. If foul brood gets into weak hives, it will wipe these out very quickly, but if into strong ones, the watchful beekeeper will notice the weakening of his hives in time to save them before they have dwindled into a handful of bees.

In many cases the strain of bees kept is very poor, being either black bees or hybrids. Some hybrids are good honey gatherers, especially the first cross, but in most cases the Italians are much better workers and resist disease better.

In Apiaries with both Italian and hybrid bees, the heavy hives are usually Italian, and in no case where I have found foul brood, have the bees been pure Italian.

In one case where moth had cleaned out a hive of cross-bred bees, a swarm of fairly good Italians took possession of the hive and cleaned out the moth, building their new comb on to the old black comb that had been partially destroyed by the moth.

Also the Italians are usually quiet bees, easy to handle, clinging to the combs after a little puff of smoke, instead of rushing about on the top of the frames and over the sides of the hive, generally making it uncomfortable for the beekeeper in more ways than one.

Beekeepers, generally, would find that it would pay them well to give more attention to the breeding and selection of their queens from their best hives, or by purchasing from a reliable breeder.

Foul brood.—With regard to foul brood, I have found several isolated cases, where least expected. In all cases but one it has been in towns. In that one exception the bees had been brought from a town to the country some time previously.

These facts considerably strengthen the argument that the disease is brought into the State in imported honey. Empty containers being thrown out by grocers and others, in towns, and these are naturally cleaned up by bees when there is not much nectar to be gathered from flowers.

Beekeepers will be glad to know that in some nine cases found last October, the methods adopted have apparently been successful, and the Apiaries appear to be free from disease. We cannot, however, be certain of the cure yet, as spores may have been lying dormant in some hive, and break out later, or it may be carried to another Apiary and not be discovered yet.

All beekeepers, especially those in the vicinity of towns, should watch their brood carefully and send a sample of any brood of abnormal appearance to the Agricultural Department for examination.

Transferring bees to new hives.—I frequently receive inquiries regarding the transference of bees from old hives (or boxes from which the combs cannot be removed) into Standard Frame Hives. The following particulars may be of assistance to any such inquirers.

1. Prepare the new hive with foundation wired into the frames (full sheets by preference), with a queen excluder on top under the cover.

2. Remove the old hive, and place in front of the original location.

3. Place new hive in old position on a stand or box, so that the bottom of the new hive is a few inches higher, and projecting over the top of the old hive which is now in front.

4. Slide the body of the new hive forward, so that it projects about two inches beyond the floor board, close the gap thus made at the back by a piece of wood or rag.

5. Remove the top of the old hive, if removable, but if a box, turn the box upside down and raise the back with a block of wood or brick, the back edge resting against the front edge of floor board of new hive, so that the bees can crawl from the old hive to the new hive.

6. Now drum the sides of the old hive vigorously. After a little while the bees will be noticed crawling up the back of the old hive and into the new one. They may be hurried up by an occasional puff of smoke at the front and lower end of the old hive. Watch carefully to see the queen pass up. She will probably not go up until the majority of the bees have gone.

7. When the queen is in the new hive, slide the new hive back into the old position. Remove the cover and place the old hive on top of the queen excluder.

The queen being below, no further eggs will be laid in the old hive, and in a month's time all the brood will be hatched, and the old hive can be removed.

An alternative method to placing the old hive on top of the new one, is to cut out the old comb, tie any good slabs of brood into empty frames, with binder twine or tape, and place these in the centre of the new hive. This method is adopted by many beekeepers, but it is rather a messy job, and means the loss of a small amount of brood. The first method is the simplest for beginners.

FIELD EXPERIMENTS WITH WHEAT.

AVONDALE STATE FARM.

A. S. WILD, Agricultural Adviser.
J. BAILEY, Farm Manager.

The field experiments conducted at this farm were the Rates of Seeding, Rates of Superphosphate, Basic Slag and Superphosphate Experiments.

The plots were each one-eighth of an acre in area. Each experiment was planted in sections, each section being repeated five times.

The soil on which the experiments were conducted is typical undulating York and Jam timber country and has been cleared a number of years.

The land for this year's experiment was ploughed 4 to 5 inches deep with a mouldboard plough early in August. Late in September it was cultivated with a springtyne cultivator, disc cultivated during March after rain, and springtyne cultivated on the 6th and again on the 19th May.

The plots were free from weeds and in good condition when planted.

The monthly rainfall as officially recorded during 1927 at Beverley, four miles distant, together with the average for the past 42 years, is hereunder:—

—	Jan	Feb.	Mar.	April	Growing Period.							Nov	Dec.	Total for Year
					May	Jn	July	Aug	Sept.	Oct	Total			
1927 .	9	21	337	50	103	303	319	167	189	126	1,207	31	7	1,662
Average, 42 yrs.	30	40	64	88	220	321	324	246	170	100	1 381	47	40	1,690

The rainfall during the growing period was 174 points below the average. This was mainly accounted for in May, when the registration was 117 points and in August 79 points below the average. This caused a check in the growth of crops during the later part of August and early September but the yields were not affected.

Rates of Seeding Experiment.

The midseason variety Nabawa was planted in this experiment. Superphosphate was applied at 100lbs. per acre.

The results obtained this year, together with the average for the two years the experiment has been conducted, are set out hereunder:—

AVONDALE STATE FARM—RATE OF SEEDING EXPERIMENT.
GRAIN YIELD.

Variety · Nabawa Rate of Super 100lbs per acre Planted 10th May, 1927

Rate of Seed per Acre.	Computed Yield per Acre										Average Yield per acre		Percentage. 1927.	Percentage 1926-27
	Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.					
	bus.	lbs.	bus	lbs.	bus	lbs	bus	lbs.	bus.	lbs.	bus	lbs	%	%
90lbs.... ...	15	27	16	30	15	54	16	30	15	0	15	52	110	108
45lbs. (Control)	16	3	15	18	13	48	13	12	13	48	14	26	100	100
60lbs	16	48	16	3	14	24	14	6	13	30	15	10	105	105

The results, which are for two years only, indicate that a slightly better return may be expected when the heavier rates of seed are sown in this district, which is favoured with good winter and spring rains.

Rates of Superphosphate Experiment.

The midseason variety Nabawa was also planted in this experiment and was sown at the rate of 45lbs. per acre.

The results obtained this year, together with the average results for the two years the experiment has been conducted, are set out hereunder:—

RATE OF SUPERPHOSPHATE EXPERIMENT.

Variety: Nabawa. Seed 45lbs per acre Planted 10th May, 1927.

Rate of Super per Acre	Computed Yield per Acre										Average Yield per Acre		Percentage Yield 1927	Percentage Yield 1926-27
	Sec 1		Sec 2		Sec 3		Sec 4.		Sec 5					
	bus	lbs.	bus	lbs.	bus	lbs.	bus.	lbs	bus	lbs	bus	lbs.	%	%
225lbs . .	14	51	17	15	16	30	15	27	21	18	17	4	113	108
75lbs. (Control)	10	48	16	3	13	39	15	27	19	39	15	7	100	100
150lbs. .	13	30	18	0	15	0	17	42	23	51	17	36	116	108

The results from both the heavier rates of application are almost equal and indicate that better returns are obtained when superphosphate is applied up to 150lbs. per acre.

Basic Slag and Superphosphate Experiment.

As in previous years this experiment was carried out with 22 per cent. superphosphate and 17 per cent. basic slag (Thomas Phosphate).

It was designed to ascertain the advantage, if any, obtained when phosphoric acid was applied to the soil in basic slag, as compared with phosphoric acid when applied in superphosphate.

The plots were arranged so that both the amount (by weight) and the quality (percentage of phosphoric acid) of the fertiliser applied per acre were compared with 22 per cent. superphosphate, the principal fertiliser used by wheat farmers.

To meet these requirements three plots were planted, viz.:—

1.—75lbs. per acre of 17 per cent. basic slag (equal by weight to control).

2.—75lbs. per acre of 22 per cent. superphosphate (control).

3.—97lbs. per acre of 17 per cent. basic slag (supplying the same amount of phosphoric acid as 75lbs. of superphosphate).

The area of each plot was one-eighth of an acre, and each section was repeated five times.

There was a marked difference between the plots throughout the growing period, these differences being indicated in the subsequent grain yields which, together with the averaged results for the past two years, are set out in the table hereunder:—

BASIC SLAG AND SUPERPHOSPHATE EXPERIMENT.

GRAIN YIELDS.

Variety: Nabawa. Rate of Seed, 45lbs. per acre. Planted 10th May, 1927.

Rate of Fertiliser per Acre.	Relative quantities Phosphoric acid per Acre.	Computed Yields per Acre Sec. 1		Sec 2		Sec. 3.		Sec. 4		Sec 5.		Average Yield per Acre.		Percentage Yield 1927.	Percentage Yield 1926-7
		bus.	lb.	bus	lb	bus	lb	bus.	lb	bus	lb	bus.	lb	%	%
97lbs. 17 % Basic Slag	100	18	0	15	54	16	30	18	9	20	6	17	44	75	84
75lbs, 22 % Superphosphate (Control)	100	24	36	22	30	22	57	24	45	23	15	23	37	100	100
75lbs, 17 % Basic Slag	77	15	18	16	39	17	51	18	45	14	15	16	34	7	

Although there is not a great difference in the results obtained from the plots receiving the two different rates of basic slag, there is, however, a considerable difference between these and the control plot of 75lbs. of superphosphate, and it can be concluded from these results that the wheat plants' requirement of phosphoric acid is best supplied by superphosphate.

FIELD EXPERIMENTS WITH WHEAT AND OATS AT THE MERREDIN EXPERIMENT FARM.

I. THOMAS, Superintendent of Wheat Farms.

J. H. LANGFIELD, Farm Manager.

The rainfall recorded at the farm during the year, together with the average for the past 16 years, is set out hereunder:—

Year.	Jan.	Feb	Mch	Apl	Growing Period May	June.	July	Aug.	Sept	Oct	Total	Nov	Dec.	Total for year
1927 ..	9	2	565	36	53	164	132	89	167	61	669	19	61	1,261
Average, 16 yrs	59	53	85	78	128	174	180	138	92	81	802	37	59	1,17

The excessive rain during March caused the fallowed land to set down, and difficulty was experienced in obtaining a good even seed bed. Following on these rains the rainfall during the growing period (May-October), although light, was regular and sufficient until the end of August when a dry spell occurred.

The climatic conditions which prevailed during the winter months were ideal for the growth of the crops. Clear, frosty nights were experienced, the effect of which was to retard rank flaggy growth and encourage the plants to stool out better.

Fortunately, the dry spell at the end of August was of short duration and was followed by good rains during September and useful rains in October, with the results that excellent yields were obtained.

All experiments were planted on fallow except the fertiliser experiment, some of the plots of which, owing to its nature, were planted on unfallowed land.

The land was of typical Salmon and Gimlet forest country and had been cleared some years previously.

The system of cropping is a threesome—fallow, crop, stubble.

RATE OF SUPERPHOSPHATE EXPERIMENT.

The plots for this experiment, which is now of five years duration, were ploughed with a heavy disc plough in June, 1926, to a depth of four inches and cultivated with a springtyne implement in September. It was left in this state until March, when it was again cultivated with the springtyne.

A disc cultivation early in April, a springtyne cultivation at the end of the same month, and also twice prior to seeding, completed the soil working operations.

As in previous years the variety sown was Gluyas Early, the rate being 45 lbs. of seed per acre. Seeding took place on May 20th, 1927.

Owing to the cold weather and the shortage of surface moisture, germination was slow. A good fall of rain on June 4th, however, ensured a good, even germination. The seed was treated with carbonate of copper as a preventative against bunt.

As in previous years, the plots receiving the heavier dressings of superphosphate were more dense and vigorous than those receiving lesser amounts.

The results of these experiments, together with the percentage results for the past five years, are given hereunder:—

RATE OF SUPERPHOSPHATE EXPERIMENT.

GRAIN RESULTS.

Variety, "Gluyas Early." *Planted May 20th*, 1927. *Seed*, *45lbs. per acre.*

Rate of Superphosphate per acre	Computed Yield per Acre										Average Yield, 1927		Percentage Yields, 1927	Percentage Yields 1923-27.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5					
	bus.	lbs.	bus.	lbs.	bus.	lbs	bus	lbs.	bus	lbs.	bus.	lbs.	%	%
150 lbs	32	16	32	0	30	24	33	4	32	40	32	5	107	110
75 lbs.	30	8	29	28	29	28	30	8	30	56	30	1	100	100
225 lbs	34	0	32	24	34	16	35	20	35	4	34	13	114	116

Hay Results.

Rate of Superphosphate per acre.	Computed Yield per Acre.									Average Yields, 1927.			Percentage Yields, 1927.	Percentage Yields, 1923-27.
	Section 1.			Section 2.			Section 3.							
	cwt.	qrs	lbs.	cwts	qrs.	lbs.	cwt.	qrs.	lbs.	cwt	qrs.	lbs.	%	%
150 lbs .. .	47	3	20	52	3	20	54	1	4	51	2	24	105	112
75 lbs. . ..	46	2	16	49	0	16	52	1	12	49	1	15	100	100
225 lbs	57	0	8	58	2	16	58	1	4	58	0	0	117	119

It will be noticed from the above tabulations that the percentage results of both hay and grain are almost identical, and as these results have been obtained over a period of five years, it can be concluded that increased yields are obtained when the heavier dressings of superphosphate are applied.

RATE OF SEEDING EXPERIMENT.

As in previous years, this experiment was carried out with two varieties, viz., a free stooling one, "Nabawa," and a sparse stooler, "Florence."

The land for this trial was ploughed in June, 1926, to a depth of four inches, cultivated with a springtyne cultivator in September and again after the first rains in March. A disc cultivation in early April and a springtyne cultivation prior to planting completed the soil preparation.

The seed was sown at the rates of 30, 45 and 60 lbs. per acre. In the midseason variety section, sown on April 14th, the immediate germination was patchy, but after a fall of 38 points on May 8th a good general germination resulted.

The early variety section gave a slow but even germination, the cold weather and light rainfall impeding the primary growth.

RATE OF SEEDING EXPERIMENT.

Variety, "Nabawa." *Planted 14th April.* *Superphosphate, 100lbs. per acre.*

Rate of Seed	Computed Yield per Acre										Average Yield, 1927		Percentage Yields, 1927	Percentage Yields, 13 years.
	Section 1.		Section 2		Section 3		Section 4		Section 5.					
	bus	lbs.	bus	lbs	bus	lbs	bus	lbs	bus	lbs.	bus	lbs	%	%
30lbs. per acre	28	0	30	0	29	52	33	20	29	52	30	13	92	95
45lbs. per acre .	31	20	33	12	33	4	34	16	32	16	32	49	100	100
60lbs. per acre ..	34	8	32	32	31	14	33	36	32	32	32	55	100	100

Variety, "Florence" *Planted 21st May* *Superphosphate, 100lbs. per acre.*

Rate of Seed.	Computed Yield per Acre.										Average Yield, 1927.		Percentage Yield, 1927	Percentage Yield, 13 years.
	Section 1		Section 2.		Section 3.		Section 4		Section 5					
	bus.	lbs	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus	lbs.	bus	lbs.	%	%
30lbs. per acre . .	26	40	27	12	26	48	26	56	28	8	27	9	96	96
45lbs. per acre ...	28	56	27	36	27	12	28	32	29	4	28	16	100	100
60lbs. per acre	27	36	27	12	28	16	28	8	28	16	27	53	99	96

From the summarised results it is quite apparent that it is unnecessary to sow at a greater rate than 45 lbs. per acre of graded seed for either hay or grain.

FERTILISER EXPERIMENT.

This experiment, which is also being carried out at the Chapman Experiment farm, is conducted for the purposes of ascertaining:—

(1) Whether a small quantity of nitrogenous fertiliser, 25 lbs. per acre of sulphate of ammonia, applied at planting time, has a beneficial effect upon the yields of wheat crops; and

(2) Whether the same quantity of nitrogenous fertiliser will lessen the need for fallowing.

For the purpose of the trial three plots were fallowed in July (1926) and two plots situated between them were left unfallowed. The fallowed plots were ploughed with a heavy disc implement 4in. deep and were cultivated with a springtyne cultivator in September.

The unfallowed plots were ploughed early in April after 565 points of rain falling in March. After this date all the plots received the same cultivation, being once disc cultivated, followed by a cultivation with the springtyne machine prior to seeding.

The germination was slow, owing to lack of surface moisture, but a good even germination followed the 38 points of rain which fell on 8th of May.

The results obtained this year, together with the percentage results for the past three years, are given hereunder:—

FERTILISER EXPERIMENT.

Variety, "Nabawa." *Planted, 5th May,* 1927. *Superphosphate,* 112*lbs. per acre.*

Treatment.	FALLOWED.									
	Computed Yield per acre.						Average Yields, 1927.		Percentage Yields, 1927.	Percentage Yields, 1925-27.
	Section 1.		Section 2.		Section 3					
	bus	lbs.	bus	lbs.	bus.	lbs	bus.	lbs.	%	%
112lbs. Super	26	8	30	56	31	4	29	23	100	100
112lbs. Super · 25lbs. Sulph. of Ammonia	25	36	28	48	24	48	26	24	90	97

Treatment.	UNFALLOWED.								Percentage Comparisons	
	Computed Yield per acre.				Average Yield, 1927.		Percentage Yields, 1927.	Percent age Yields, 1925-27.		
	Section 1.		Section 2.						Fallowed.	Unfallowed.
	bus.	lbs.	bus.	lbs.	bus.	lbs.	%	%	%	%
112lbs. Super... ...	25	12	25	36	25	24	100	100	100	86
112lbs. Super ; 25lbs. Sulph. of Ammonia	23	44	24	32	24	8	95	95	100	91

From the above results it can be concluded that on forest land the application of a small amount of sulphate of ammonia at the time of seeding does not increase the yields, and also that it does not reduce the need for fallowing, but rather does it emphasise the necessity for it to increase the yields.

Fallowing is not only responsible for the conservation of moisture, but on well worked fallow the process of nitrification is also stimulated during the spring and summer months, and sufficient nitrate is made available in the soil for the use of the succeeding crops.

TIME OF SEEDING EXPERIMENT.

This experiment has been conducted for the past five years in order to determine the most suitable month for seeding the wheat crop.

The land was ploughed in June, 1926, 4in. deep with a heavy disc implement and was springtyne cultivated in September. The land lay thus till April, when it was disced and afterwards springtyne cultivated, the May plots being again springtyned before seeding, as were the June and July plots also. The latter were harrowed after drilling.

The tabulated results below show last year's results, together with the averages from 1923-27:—

TIME OF SEEDING EXPERIMENT.

Variety, "Gluyas Early." *Seed, 45lbs. per acre.* *Superphosphate, 112lbs. per acre.*

Date of Planting.	Computed Yield per Acre										Average Yield per acre, 1927		Percentage Yield, 1927.	Average Yield		Percentage Yield.
	Section 1		Section 2.		Section 3		Section 4		Section 5							
	bus	lbs	bus	lbs.	bus	lbs	bs.	bus	bus	lbs.	bus	lbs	%	bus.	lbs	%
May 18th	33	4	32	56	32	0	33	20	30	56	32	27	100	27	36	100
June 15th	26	0	28	32	27	12	27	4	26	0	27	5	83	23	31	85
July 15th	12	2	12	48	12	48	11	14	11	12	12	7	37	13	57	51

There is only one conclusion that can be drawn from the above results of the experiment which has been conducted for the past five seasons, and that is the seeding should be completed during the month of May. This is the practice generally adopted and can be continued with every confidence.

OAT VARIETY TRIAL.

This experiment has been conducted during the past five years. This year four varieties were used, with "Burt's Early" as a control.

The land, which was typical gimlet and salmon country, was ploughed in June, 1926, to a depth of 4in., cultivated in September with a springtyne cultivator, again cultivated with the same implement after the March rain, disc cultivated in early April and again cultivated with a springtyne machine before planting.

The results obtained this year, together with previous years' percentage averages, are as follow:—

OAT VARIETY TRIAL.

GRAIN RESULTS.

Seed, 37lbs. per acre. *Superphosphate, 100lbs. per acre.*

Variety	Computed Yield per Acre										Average		Percentage Yield, 1927.	Average Yield. 1923-27.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5					
	bus.	lbs.	bus.	lbs	bus.	lbs.	bus	lbs	bus	lbs.	bus.	lbs.	%	%
Burt's Early (Control)	38	8	37	24	38	0	40	8	38	21	38	21	100	100
Mulga	49	32	48	8	49	32	49	0	45	16	48	17	126	130
Algerian .	37	16	34	24	35	8	27	0	25	32	32	0	83	104
Guyra . . .	36	24	44	24	46	16	43	24	11	24	42	22	111	112
Glen Innes No. 7	37	16	46	0	51	0	44	8	42	0	44	5	116	110*
Burt's Early (Control)	37	32	35	8	39	16	38	8	38	32	37	35	100	100

* Average for 3 years

HAY RESULTS.

Variety.	Computed Yield per Acre.									Average Yield, 1927.			Percentage Yield, 1927	Percentage Yield. 1923-27.
	Section 1.			Section 2.			Section 3.							
	cwt.	qrs.	lbs	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs	lbs.	%	%
Burt's Early (Control)	47	2	8	55	0	16	52	0	16	51	2	13	100	100
Mulga	47	3	20	49	3	12	53	1	4	49	2	21	96	111
Algerian	45	2	8	45	0	16	46	2	24	45	3	7	89	95
Guyra	47	1	20	49	3	4	49	3	4	49	0	0	97	107
Glen Innes No. 7	46	0	24	47	3	12	45	2	24	46	2	11	92	104*
Burt's Early (Control) .	50	0	0	51	2	0	47	3	20	49	3	7	100	100

* Average for 3 years.

In the plots harvested for hay this year, excellent yields were obtained from all varieties. The control plot of "Burt's Early" giving the highest returns was closely followed by the early variety "Mulga" and the midseason variety "Guyra." The early variety "Glen Innes No. 7" was a little better than the late variety "Algerian." However, the average percentage results for the experiment since its commencement in 1923 confirms the conclusion already drawn that for districts with a rainfall similar to that experienced at Merredin the early and midseason varieties are the most suitable for hay purposes.

The yields obtained from the grain section of the experiment were also high, and with the exception of the late maturing variety, "Algerian," which was considerably below that of the control, the yields obtained from the other varieties were considerably above. The average percentage results support this with the exception of Algerian, which in these results shows slightly better than the control, but in view of the comparatively low yields this year it can be concluded that the midseason and early varieties are also the most suitable to plant for grain purposes.

FIELD EXPERIMENTS WITH WHEAT.

CHAPMAN EXPERIMENTAL FARM.

I. THOMAS, Supt. of Wheat Farms.
P. JEFFREY, Farm Manager

The land on which the experiments were conducted originally carried jam timber, and had been cleared some years previously.

The following table shows the monthly rainfall recorded at the farm during the year, together with the averages for the past 22 years:—

---	Jan	Feb.	Mch.	Apl	Growing Period.						Total	Nov.	Dec.	Total for Year.
					May:	June	July	Aug.	Sept	Oct.				
1927	4	10	524	35	261	532	390	277	221	85	1,766	8	94	2.441
Previous 22 years av'ge	28	52	49	44	226	428	394	264	170	98	1,580	27	26	1.806

These records show the total rainfall for the year to be 635 points above the average, whilst that for the growing period was 186 in excess of the average. This excess was not beneficial, but rather the reverse, as some of the land became waterlogged early in the season, which was not favourable for the growth of the crops.

All the experiments were planted on fallowed land. The initial ploughing was done during the winter months the previous year, when the land was in excellent condition for this operation, which was followed by cultivation with either a springtyne or disc cultivator to destroy weeds and maintain a mulch to assist moisture conservation.

After the heavy rainfall in March the weed seeds germinated readily, when it was found necessary to use the disc cultivation implement to deal with the subsequent growth. This was followed by a springtyne cultivation prior to planting.

Rate of Superphosphate Experiment.

This experiment was commenced in 1923. For last year's experiment the plots were ploughed in June with a 4-furrow mouldboard plough, cultivated with a disc implement about the middle of September, and again with a springtyne machine about the end of the same month. During April of the present year it was disc-cultivated, and, owing to weed growth, it was found necessary to repeat the operation in May. It was springtyne cultivated prior to seeding on May 18th. The seed bed was in excellent condition.

The following tables show the results of the experiments, together with averages for the total period for which the experiment has been conducted.

RATE OF SUPER EXPERIMENT.

GRAIN RESULTS.

Variety, "Nabawa." *45lbs. seed per acre.* *Planted* 18th *May,* 1927.

Rate of superphosphate applied per acre	Computed Yield per acre.					Average yield per acre, 1927.	Percentage Yield, 1927.	Percentage Yield, 1923-27.*
	Section 1.	Section 2.	Section 3	Section 4.	Section 5			
	bus. lbs	bus lbs	bus. lbs	bus. lbs	bus. lbs	bus lbs.	%	%
150 lbs.	19 28	19 52	19 12	19 52	18 24	19 22	103	103
75 lbs.	18 48	19 12	19 12	19 36	17 4	18 46	100	100
225 lbs ..	19 52	20 56	20 8	20 16	19 36	20 10	107	114

* 1926 results not taken

HAY RESULTS.

Rate of superphosphate applied per acre.	Computed Yield per acre			Average yield per acre, 1927	Percentage Yield 1927.	Percentage Yield, 1923-27.*
	Section 1	Section 2.	Section 3			
	cwt. qrs. lbs.	cwt. qrs. lbs	cwt qrs. lbs.	cwt. qrs. lbs		
150 lbs.	24 3 15	26 2 1	26 3 2	26 0 6	108	112
75 lbs.	24 2 14	23 2 1	24 0 26	24 0 14	100	100
225 lbs.	28 1 7	26 1 10	29 1 7	27 3 17	116	114

* 1926 results not taken.

As with a similar experiment at the Merredin Experiment Farm, it is again indicated that the use of higher amounts of superphosphate results in increased yields for both hay and grain.

Rate of Seeding Experiment.

This experiment is planted in two sections, the differentiation being the stooling properties of the two varieties of wheat planted. Yandilla King was selected for the free stooling variety, while the sparse stoolers were represented by S.H.J.

The land for both sections was similarly worked. It was ploughed in July, 1926, with a mouldboard plough and was springtyne cultivated in September.

In March it was disc cultivated and again in May to kill early weeds germinated by the March rain; the harrow preceded the drill.

The plots planted with the variety Yandilla King were affected by stem rust in the spring, the grain of which was pinched and shrivelled, which accounts for the low yields obtained.

The following tables give the yields of the two sections:—

RATE OF SEEDING EXPERIMENT.

GRAIN YIELDS.

Variety, "S.H.J." Planted 24th May, 1927. Superphosphate, 150lbs. per acre.

Rate of seed per acre.	Computed Yield per acre										Average yield per acre, 1927		Percentage Yields 1927.	Average yield per acre, 1923-27.		Average percentage Yield, 1923-27.
	Section 1.		Section 2		Section 3		Section 4.		Section 5							
	bus.	lbs	bus	lbs	bus.	lbs	bus	lbs.	bus	lbs	bus	lbs	%	bus.	lbs.	%
60	13	4	12	40	11	44	12	24	12	24	12	27	107	16	32	106
45	12	21	11	28	11	4	10	56	12	16	11	37	100	15	37	100
90	13	12	12	0	11	52	11	44	12	16	12	13	105	17	25	111

HAY YIELDS.

Rate of seed per acre.	Computed Yield per acre									Average yield per acre, 1927.			Percentage Yields, 1927.	Average yield per acre, 1923-27.			Average percentage Yield, 1923-27.
	Section 1.			Section 2			Section 3.										
	cwt.	qrs.	lbs.	cwt.	qrs	lbs	cwt.	qrs	lbs	cwt.	qrs.	lbs.	%	cwt.	qrs.	lbs.	%
60 ...	16	3	12	17	0	0	19	0	16	17	2	19	117	27	1	5	105
45	14	2	16	14	3	12	15	3	12	15	0	13	100	25	3	19	100
90	16	2	8	17	1	12	17	0	0	16	3	25	112	28	1	2	108

GRAIN YIELDS.

Variety, "Yandilla King." Planted 30th April, 1927. Superphosphate, 150lbs. per acre.

Rate of seed per acre.	Computed Yield per acre.										Average yield per acre, 1927.		Percentage Yield, 1927.	Average yield per acre, 1923-27.		Average per centage Yield, 1923-27.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5.							
	bus.	lbs	bus	lbs	bus	lbs	bus.	lbs	bus.	lbs	bus.	lbs.	%	bus.	lbs.	%
60	6	8	5	14	5	28	5	28	6	8	5	47	109	18	57	97
45 ..	4	56	5	12	4	56	5	36	5	52	5	18	100	19	36	100
90	5	44	5	28	5	28	6	16	6	16	5	50	110	19	44	101

HAY YIELDS.

Rate of seed per acre.	Computed Yields per Acre									Average yield per acre, 1927.			Percentage Yields, 1927.	Average yield per acre, 1923-27.			Average percentage Yields. 1923-27.
	Section 1.			Section 2			Section 3.										
	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	cwt.	qrs.	lbs.	%	cwt	qrs.	lbs	%
60	10	1	4	9	2	24	10	2	16	10	0	24	101	24	1	14	92
45	8	2	24	11	0	16	10	2	8	10	0	16	100	26	1	21	100
90	9	2	24	11	3	20	8	2	24	10	0	13	100	26	0	14	99

The results of this experiment in previous years have indicated that with a sparse stooling variety, the yields for both hay and grain are increased when the heavier rates of seed are sown. This is supported by the results obtained this year, particularly on the plots harvested for hay.

With the free stooling variety the grain yields obtained this year from the plots planted with the heavier rates of seed are better than the control plot planted with 45lbs. This is contrary to the results obtained in previous years, also the averaged yields obtained since the experiment was commenced in 1923. These averaged results indicate that with a free stooling variety there is no advantage in increasing the rate of seeding over 45lbs. per acre. This is supported by the hay yields obtained this year, and also in the average results during the period the experiment has been conducted, viz., 1923-27.

Time of Seeding Experiment.

This experiment was commenced in 1923 and has been planted each year since, but owing to the plots being destroyed by fire in 1924 and other factors interfering with the results in 1925 and 1926, the results have not been obtained.

The land was ploughed with a four-furrow mouldboard plough in July, 1926, and springtyne cultivated late in September. It was again cultivated in October with a disc implement to check weed growth. In March the plots were springtyne cultivated, and, prior to seeding, all sections were disc cultivated and harrowed.

At the time of planting, the whole area was free of weed growth and a good seed bed obtained.

The June and July sections were each again springtyned prior to planting.

The following gives the results obtained:—

TIME OF SEEDING EXPERIMENT.

GRAIN RESULTS.

Variety, "Gluyas Early." Seed, 45lbs. per acre. Superphosphate, 100lbs. per acre.

Planted.	Computed Yield per Acre						Average yield per acre, 1927		Percentage yield, 1927	Average yield, 1923-27		Average percentage yield, 1923-27.
	Section 1		Section 2.		Section 3							
	bus	lbs	bus	lbs	bus.	lbs.	bus.	lbs.	%	bus	lbs	%
June	14	48	13	28	13	52	14	3	83	15	51	81
May	16	48	17	20	16	32	16	53	100	19	32	100
July	9	20	8	40	9	4	9	1	57	11	48	60

The percentage results obtained from this experiment this year are very similar to those of 1926, and from them it is very evident that the yields of the wheat crop are decreased when planting is delayed until June.

These decreased yields from the June and July plots cannot be due to lack of moisture during any part of the growing period, but rather to an excess of rain during the early winter months. As this excess is typical for this period in this district, every endeavour should be made to complete the planting by the end of May.

The planting of a suitable variety in April is recommended rather than extending the planting into June. This will permit the young plants to develop a stand strong enough to better withstand the unfavourable waterlogged condition of the soil during the early winter months.

Fertiliser Experiment.

The objects of this experiment are to determine:—

1. Whether a small quantity of nitrogenous feriliser, 25lbs. per acre, of sulphate of ammonia applied at planting time has a beneficial effect upon the yields of wheat crops; and
2. Whether the same quantity of nitrogenous fertiliser will lessen the need for fallowing.

For the purpose of the trial, three plots were fallowed in August the previous year (1926) and two plots situated between these were left unfallowed. The fallowed plots were ploughed with a four-furrow mouldboard plough, 4in. deep, and were cultivated with a springtyne cultivator early in September. It was again similarly treated at the end of March and at the time of seeding. The unfallowed land was ploughed with the four-furrow mouldboard plough on the 16th May and cultivated with the springtyne machine prior to planting on the 23rd May.

The tabulated results are given hereunder:—

FERTILISER EXPERIMENT.

Variety, "Nabawa." Planted 23rd May, 1927. Superphosphate, 100lbs. per acre.

FALLOWED.

Treatment	Computed Yield per Acre						Average, 1927.		Percentage Yield.	
	Section 1.		Section 2.		Section 3.				1927	1926-27.
	bus	lbs.	bus.	lbs	bus	lbs	bus	lbs	%	%
100lbs. Superphosphate	19	44	22	0	23	12	21	39	100	100
100lbs. Superphosphate, 25lbs. Sulph of Ammonia	19	44	21	44	23	28	21	39	100	98

UNFALLOWED

Treatment.	Computed Yield per Acre.				Average 1927		Percentage Yield.		Percentage Comparisons.	
	Section 1.		Section 2.				1927	1926 27.	Fallowed	Unfallowed.
	bus.	lbs	bus.	lbs.	bus.	lbs	%	%	%	%
100lbs. Superphosphate	15	28	18	24	16	56	100	100	100	75
100lbs. Superphosphate 25lbs. Sulph. of Ammonia	18	20	17	52	18	6	107	100	100	77

The results above are for two years, and, as will be noticed, the average results obtained this year from the fallowed plots are remarkably even, whilst the percentage results for the two years are almost equal. This shows that the small application of 25lbs. of sulphate of ammonia at the time of planting has, up to the present, not increased the grain yields on the fallowed plots.

The average results from the unfallowed plots this year show that grain yields were increased by the addition of the 25lbs. of sulphate of ammonia, whilst the average percentage results for the two years are the same. No definite conclusion can be drawn, because yields of the plots receiving the sulphate of ammonia last year were nine per cent. below the yields obtained from the control plot.

However, the results of this experiment, as in the previous year, emphasise the importance of fallowing.

Fallowing is not only an aid to the conservation of moisture, but also during the spring and summer, on well cultivated land, the process of nitrification is stimulated and sufficient nitrates are made available for the use of the succeeding crop.

FIELD EXPERIMENTS WITH OATS AT WAGIN.

A. S. WILD, B.Sc. (Agric.), Agricultural Adviser.

Two experiments with oats were conducted on the property of Mr. G. Austin Piesse, Wagin. They were:—

1. Basic Slag and Superphosphate experiment.
2. An Oat Variety Trial.

The land on which these experiments were conducted was a light grey to red loam, running to a gravelly quartz at one end, the original timber being White Gum, Sheoak, and Jam.

The land had been ploughed to a depth of 4in. during the month of September, 1926. Prior to seeding during April, 1927, the land was cultivated with a springtyne cultivator.

The monthly rainfall, as officially recorded at Wagin during 1927, together with the average over 37 years, is shown hereunder:—

—	Jan.	Feb	Mch.	Apl.	Growing Period.							Nov	Dec.	Total for year
					May.	June	July.	Aug.	Sept.	Oct.	Total			
1927 ...	...	...	209	49	136	349	218	156	226	146	1,231	15	34	1,538
Average, 37 yrs	28	63	113	96	208	297	297	241	191	129	1,363	48	41	1,752

The total rainfall for the year, 1,538 points, is 214 points below the average, and that for the growing period is 132 points below. Except for a short dry spell in August, the rainfall throughout the remainder of the growing period was regular and consistent.

Variety Trial with Oats.

The object of this experiment was to compare the yields of the different standard varieties of oats.

Four varieties were planted—

- Algerian, the standard late variety.
- Guyra, the standard midseason variety.
- Burt's Early, the standard early variety.
- Mulga, a promising new variety, which is a close rival of Burt's Early, as a general purpose variety.

All plots were planted in duplicate at the rate of 50 lbs. of seed per acre with 100lbs. of superphosphate on the 12th April. The area of each plot was ½ an acre.

The results obtained are set out in the table hereunder.

EXPERIMENTS AT WAGIN—OAT VARIETY TRIAL.

GRAIN YIELDS.

Rate of seed, 50lbs. per acre. Rate of super, 100lbs. per acre. Planted 12th April, 1927.

Variety.	Computed Yield per Acre.				Average Yield per Acre.	
	Section 1.		Section 2.			
	bus.	lbs.	bus.	lbs.	bus.	lbs.
Algerian	27	1	25	22	26	11
Guyra	30	24	30	24	30	24
*Mulga	14	34	14	39	14	36
Burt's Early	18	7	23	37	21	2

* Lodged before maturing.

The results are for one year only and no definite conclusion, therefore, can be drawn. They are, however, in favour of the midseason variety, Guyra, which appears to be suitable grain variety for this district.

The dry spell during August no doubt had some effect on the late Variety Algerian, and consequently affected the yield.

Unfortunately, the Mulga lodged before maturity, and as a result all the grain could not be harvested.

The experience in other districts with this variety indicated that it was stronger in the straw than most varieties and its lodging in this instance, therefore, was surprising.

All varieties had the appearance of yielding well if harvested for hay.

Basic Slag and Superphosphate Experiment.

Further to advice that Basic Slag was being applied to the cereal crops in preference to Superphosphate in the Wagin district, it was arranged to conduct an experiment and compare the results of the two fertilisers.

The midseason variety of oats, Guyra, was used and planted at the rate of 50lbs. of seed per acre. Three plots were required for the carrying out of the experiment:—

1. 75lbs. of 17 per cent. Basic Slag.
2. 75lbs. of 22 per cent. Superphosphate.
3. 97lbs. of 17 per cent. Basic Slag.

The 97lbs. of 17 per cent. Basic Slag contains the same quantity of phosphoric acid as the 75lbs. of Superphosphate. Therefore, the 75lbs. of 22 per cent. Superphosphate, containing 22 per cent. phosphoric acid, is compared with—

(a) The equivalent of phosphoric acid in basic slag.
(b) The same weight of 17 per cent. basic slag.

The plots which had an area of half-acre, were planted in duplicate.

The plot yields obtained, together with the average yields, are tabulated hereunder:—

EXPERIMENTS AT WAGIN—BASIC SLAG EXPERIMENT.

GRAIN YIELD.

Variety, "Guyra." Rate of seed, 50lbs. per acre. Planted 11th April, 1927.

Rate of Fertiliser per acre.	Relative Quantity of Phosphoric Acid.	Computed Yield per Acre.				Average Yield per Acre.		Percentage Yield.
		Section 1.		Section 2.				
		bus.	lbs.	bus.	lbs.	bus.	lbs.	
75lbs. Basic Slag	77	21	10	24	11	22	30	72
75lbs. Superphosphate ...	100	31	30	31	30	31	30	100
97lbs. Basic Slag	100	29	11	29	24	29	17	93

The above results which are for one year only, indicate that the general practice of applying superphosphate can be continued with confidence with the oat crop.

FIELD EXPERIMENTS WITH WHEAT AND OATS—WONGAN HILLS LIGHT LANDS FARM.

I. THOMAS, Superintendent of Wheat Farms.
A. R. VENTON, Farm Manager.

On the whole, the season was not a favourable one in this district, although early in the season prospects were very bright.

The monthly rainfall, as officially recorded during the year, together with averages for the past 15 years, is hereunder:—

					Growing Period.									
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Total.	Nov.	Dec.	Total.
1927	...	7	301	34	143	221	260	89	57	50	820	5	11	1,178
15 yrs. average ...	47	51	101	67	195	300	272	198	133	92	1,190	38	50	1,534

During the growing period (May-October) the rainfall was 8.20 inches, the average for fifteen years being 11.90 inches. This is generally considered to be favourable for this (light land) class of country. A glance at the rain records, however, shows that whilst the first half of the growing period (May-July) was very favourable indeed, 6.24 inches being recorded against an average of 7.67 inches, the latter half was distinctly unfavourable. During this period (August-October) only 1.96 inches were recorded against an average of 4.23 inches. This amount fell on 32 different days, and was usually followed by drying winds, and consequently the crops did not get the full benefit and did not yield so well as was first expected.

The soil on which the experiment was carried out was, with the exception of the Rate of Superphosphate and the Potash Experiments, which were on the tussocky type of plain, mainly of smokebush type of country. This is the second time this land has been cropped, the first time being 1925/26.

The seed and superphosphate were sown at different rates to suit the requirements of the experiments.

RATES OF SEEDING EXPERIMENT WITH WHEAT.

This experiment has been conducted at this farm for the past three years; the wheats planted are Nabawa and S.H.J., representing free stooling and sparse stooling varieties respectively.

The plots were ploughed with a sundercut cultivating plough early in July and were skim ploughed in late August with the same implement to turn in heavy stubble missed by the initial ploughing. They were again lightly disc cultivated late in September to kill weeds and self-sown plants. In April and again prior to planting they were springtyne cultivated.

The tabulated results for the two types of stooling varieties are given below.

TABLE 1.—RATE OF SEEDING EXPERIMENT.

GRAIN YIELDS.

Early Variety, S H J   Planted 25th May, 1927.   Superphosphate 112lbs. per acre

Rate of Seed per acre.	Computed Yield per Acre										Average Yield, 1927.		Percentage Yield, 1927.	Average Yield, 1925-27.		Percentage Yield, 1925-27.
	Section 1.		Section 2		Section 3		Section 4.		Section 5							
	bus	lbs.	bus	lbs	bus	lbs	bus	lbs.	bus	lbs.	bus.	lbs.		bus.	lbs.	
60lbs.	*		7	20	8	20	6	44	6	24	7	12	99	12	49	101
45lbs.	7	36	8	16	7	24	6	44	6	24	7	17	100	12	42	100
90lbs. ...	8	20	8	32	7	36	6	40	6	36	7	33	104	13	15	104

* Owing to an accident when being harvested, the yield from this plot was so obviously below normal that the result is not given.

TABLE 2.—GRAIN YIELDS.

Variety - Nabawa   Planted 20th May, 1927.   Superphosphate 112lbs. per acre.

Rate of Seed per acre	Computed Yield per Acre.										Average Yield, 1927.		Percentage Yield, 1927.	Average Yield, 1925-27.		Percentage Yield, 1925-27.
	Section 1		Section 2.		Section 3.		Section 4		Section 5.							
	bus	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.		bus.	lbs.	
60lbs. . ..	9	12	10	44	11	24	10	40	10	28	10	30	103	17	19	101
45lbs. .	10	16	10	44	10	0	10	28	9	16	10	9	100	17	13	100
90lbs. .	11	52	11	12	10	8	11	16	10	8	10	55	108	17	38	102

From the percentage results for this year's experiment it would appear that the results were in favour of the heavier rates of seeding for both varieties, particularly the freer stooling variety, Nabawa. This is not supported by the actual yields obtained from the plots, which show that the increased yield was very little in excess of the extra amount sown, and in the average yields obtained during the three years' period the experiment has been conducted the extra amount of seed sown was not returned. Therefore, from the results of this experiment to date it can be concluded that no advantage is gained by increasing the rate of seeding above 45 lbs. per acre.

RATES OF SEEDING EXPERIMENT WITH OATS.

This year is the second in the course of this experiment. The two types are represented by Algerian, a late free-stooling variety. and Burt's Early, an early and sparse-stooling variety.

The preparation of the land was similar to that for the wheat section. The tabulated results are given below:—

TABLE 3.
RATE OF SEEDING EXPERIMENT.
OAT SECTION.

Variety, Algerian. Planted 13th May, 1927. Superphosphate 112lbs. per acre.

Rate of Seed per acre.	Computed Yield per Acre.										Average Yield, 1927		Percentage Yield, 1927	Average Yield, 1926–27.		Percentage Yield, 1926–27
	Section 1.		Section 2.		Section 3		Section 4.		Section 5.							
	bus.	lbs	bus.	lbs.	bus.	lbs.	bus.	lbs	bus.	lbs.	bus	lbs		bus.	lbs.	
40lbs .	16	32	19	16	19	16	15	24	15	8	17	11	109	17	27	117
30lbs	16	32	18	8	17	32	14	24	12	0	15	34	100	15	5	100
60lbs. . ..	19	0	19	16	19	0	15	24	19	24	18	21	117	18	4	120

TABLE 4

Variety—Burt's Early. Planted 12th May, 1927. Superphosphate 112lbs. per acre.

Rate of Seed per acre.	Computed Yield per Acre.										Average Yield, 1927.		Percentage Yield, 1927.	Average Yield, 1926-27.		Percentage Yield, 1926-27.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5.							
	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.		bus.	lbs.	
40lbs ...	19	8	19	16	27	0	25	16	26	0	23	16	100	18	23	99
30lbs. ...	19	32	17	32	27	0	25	24	27	0	23	17	100	18	30	100
60lbs.	19	24	23	8	26	28	26	32	25	8	25	1	107	19	24	105

The results for this year confirm those of the previous year, viz., that with a free-stooling variety like Algerian, increased yields are obtained when the heavier rates of 40 lbs. and 60 lbs. of seed per acre are sown. Of the two rates, however, the average results for the two years disclose that the sowing at the rate of 40 lbs. per acre is the most economical, because the increased yields obtained from the plots sown with 60 lbs. of seed per acre are not sufficient to compensate for the extra amount of seed required for planting.

As was the case the previous year with the sparse-stooling variety, Burt's Early, there was no difference between the yields obtained from the plots sown with 30 lbs. and 40 lbs. of seed per acre, but the yields of the plots sown with 60 lbs. per acre were increased this year.

These results are supported by the average results for the two years the experiment has been conducted. These average results, however, indicate that the increased rate of sowing is not warranted, because the increase in yield is not sufficient to compensate for the extra amount of seed required for planting.

RATE OF SUPERPHOSPHATE EXPERIMENT.

The rate of superphosphate experiment is conducted to determine the most profitable quantity of superphosphate to apply on this type of country for wheat. Three rates are used, viz., 75 lbs. (control), 150 lbs., and 225 lbs. per acre.

The variety Nabawa was planted on the 13th May at the rate of 45 lbs. of seed per acre.

During the growing period a considerable difference, particularly in the stooling, could be noticed between the two heavier rates of superphosphate and the control plot (75 lbs. per acre). The whole of the experiment presented an even and attractive appearance, but that of the heavier rates was much better than that of the 75 lbs. per acre.

The results for this experiment, together with the average results for the past three years, are shown hereunder:—

TABLE 5.

RATE OF SUPERPHOSPHATE EXPERIMENT.

GRAIN YIELDS.

Variety—"Nabawa." Rate of Seed—45lbs. Date planted 13th May, 1927.

Rate of Superphosphate per Acre.	Computed Yield per Acre.					Average Yield. 1927.	Percentage Yield 1927.	Percentage Yield 1925-27.
	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.			
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	%
150lbs.	16 26	17 24	16 48	17 8	16 40	16 53	113	128
75lbs.	15 44	15 4	14 28	15 4	14 24	14 57	100	100
225lbs. .. .	16 44	16 40	17 8	17 4	16 44	16 52	113	129

These results confirm the conclusion, already arrived at from previous years' experiments, that the amount of 75 lbs. of superphosphate per acre can be considerably increased with advantage on this class of soil.

MIXED FERTILISER EXPERIMENT.

The object of this experiment is to determine whether any advantage is derived by supplementing the fertiliser, superphosphate, by a potassic manure for growing a wheat crop on light land.

Three fertilisers were used and applied as follows:—

Plot 1.—150 lbs. Superphosphate per acre + 56 lbs. Muriate of Potash per acre.

Plot 2.—150 lbs. Superphosphate per acre.

Plot 3.—150 lbs. Superphosphate per acre + 140 lbs. Kainite per acre.

This section of plots, each one-eighth of an acre in area, was repeated five times. The quantity of potash in 56 lbs. of the muriate is equal to that in 140 lbs. of kainite.

Four weeks prior to planting and immediately after the land had been cultivated these two potassic fertilisers were applied to the respective plots. This course was deemed advisable owing to the possible injurious effect on the young plants when manures of this class are applied direct with the seed.

The variety Nabawa was planted at the rate of 45 lbs. of seed per acre. At the same time (1st June) 22 per cent. superphosphate was applied to each plot at the rate of 150 lbs. per acre.

Throughout the growing period no appreciable difference could be noticed between these plots.

The results of this experiment are set out in the table hereunder:—

TABLE 6.

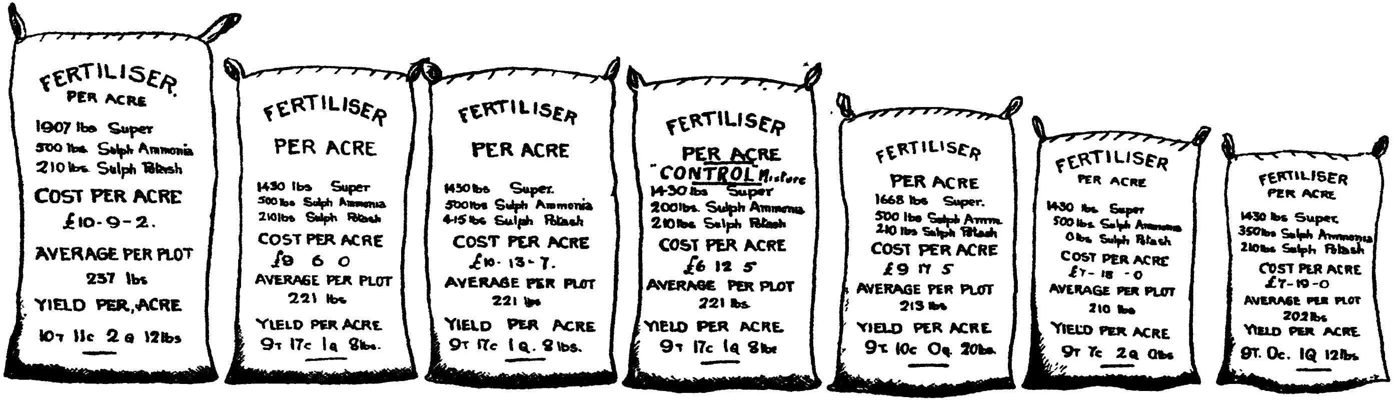
MIXED FERTILISER EXPERIMENT.

Variety—"Nabawa." Grain Results. Planted 27th May, 1927.

Fertilisers applied per Acre.	Computed Yield per Acre.										Average Yield per acre, 1927.		Percentage Yields, 1927.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5.				
	bus.	lbs.	bus.	lbs.	bus.	lbs	bus.	lbs.	bus.	lbs.	bus.	lbs.	%
Muriate of Potash 56lbs.; Superphosphate 150lbs ...	11	12	11	56	13	20	14	0	11	44	12	26	102
Superphosphate 150lbs. ...	11	20	12	4	11	52	12	24	13	28	12	14	100
Kainite, 140lbs.; Superphosphate, 150lbs.	12	0	12	40	12	36	12	8	12	32	12	23	101

These results show a very small increase in the yields of the plots to which potassic fertilisers had been applied.

The difference is so small, and the results of the experiment being for one year only, no definite conclusions can be drawn.



Graph showing composition and application of fertiliser per acre and also the cost and computed yields per acre.

FERTILISER TRIALS AT BUREKUP.

JULY--NOVEMBER, 1927.

G. N. LOWE,
Senior Potato Inspector.

The experiments were carried out on the property of Mr. C. L. Clarke and formed one of a series which is designed to find out, if possible, a suitable and economical potato manure. At a later date an abstract of these manurial experiments will be published. It was felt, however, that certain details of this last experiment would prove of interest to growers in different parts of the State.

The land was of a clayey, loamy nature, and typical of the class of country usually planted with the winter crop in this district. Half an acre was marked off, this being divided into plots, each 2½ chains in length and 2ft. 6in. wide, making an area of 1/100 of an acre per plot. The land was well ploughed to a depth of 6in. and the sets were placed on the side of the furrow some 2in. from the bottom. Each fertiliser variation was repeated six times and each of these variations was compared with the yield obtained by the use of a standard "control" mixture. The plots were arranged chequer fashion to obviate as much as possible the effects of soil variation. In spite of the care which was taken to secure as uniform a patch as possible, a portion of the western side suffered slightly from too wet a condition. The manurial variations were differences in the relative weights of nitrogen, phosphoric acid, and potash. The control mixture was 1,430lbs. super., 210lbs. sulphate of potash, and 500lbs. sulphate of ammonia. This mixture was not taken as the ideal mixture but simply as a basis of comparison. It is interesting to note, however, that this mixture, which has been the standard "control" in the departmental experiments for the last four years, has been very consistent in maintaining a high yield. In this particular experiment it takes the second place from the point of view of yield per acre.

It was noticeable that the general average yield of the experimental plots was much higher than that of the adjacent crops, in some instances just trebling the tonnage. The local growers used a potato manure which contains no potash. This increase of yield was undoubtedly largely due to the use of selected seed and the attention paid to details of planting and of general cultivation. Large "Delaware" seed was used. This seed was selected from potatoes dug in the Benger Swamp. They were cut up into 2oz. "sets," according to the method recommended by the Potato Branch, and about 12 cwt. of seed per acre was planted. The subsequent cultivations were the same as those usually given in the Burekup district.

The results obtained from this experiment were collected together and a graph has been prepared from them. The bags represent the relative yield of each plot. On each bag is printed the yield obtained, the weight and cost of the manure used.

After a study of the accompanying graph it will be seen that the heaviest yield, viz., 237lbs. per plot or a yield of 10 tons 11cwt. 2qrs. 12lbs. per acre, was that obtained from the heaviest weight of fertiliser per acre In actual bulk 23cwt. This is much more than that used by local growers, who generally sow about 14-18cwt. per acre. The actual mechanical effect of this bulk of manure may have had some effect in obtaining this comparatively high yield of potatoes. It has been demonstrated in recent trials that by increasing the amount of super as a manure, the resulting yield is increased. This indication is being followed up in future experiments.

The next three bags reveal an anomaly. Exactly the same yield was obtained by using 500lbs. and 200lbs. of sulphate of ammonia. This seems to suggest that too much ammonia can be applied. Here again our previous experiments have tended to prove this, for increase of ammonia did not always mean increase of crops. Here it may be mentioned that not any of the plots were subsequently top-dressed. All fertilisers were applied in the furrows at the time of planting. It is of course possible that young potato plants can only make use of a definite amount of nitrogen. Should the soil be fairly rich in humus, the addition of more nitrogen would not only be wasteful but detrimental to tubering. Thus it would seem a question of soil condition combined with the helpful intelligence of the grower as to what weight of ammonia should be applied. Ammonia is an expensive fertiliser. A comparison of the actual cost of the two manures shows a difference of £2 13s. 7d. per acre. Ammonia, like potash, is very soluble in water, but is well absorbed by stiff soils and soils containing clay. There is therefore no great danger of its being leached out of such soils by rain. On sandy soils slightly heavier dressings of these fertilisers should be given to allow for leaching.

With regard to potash; this fertiliser has the special function of promoting the formation of starch. Potatoes which show a high content of starch are heavy feeders on potash. Its effect on the crop is not very noticeable in the field, but a lack or abundance of potash is clearly shown by the weight and quality of the crop at the time of digging. This agrees with the result obtained where no potash was included, where there was a decrease of 11lbs. per plot or a difference of 10cwts. per acre. Not only was there a decrease in yield, but an analysis of potatoes, taken from the non-potash plots, shows a decidedly lower percentage of starch than those taken from potash plots.

In addition to the fertiliser experiments which are plotted in the graph, there was also a comparison made with seed treated with the "wet bag treatment" and seed planted directly "off knife" or untreated. The "wet bag treatment" is quite simple, but apparently of great importance to the potato growers. Numerous reports of the successful application of this method, which has been advocated by the Potato Branch for some time, have been received in this office. These reports all indicate that the "wet-bag treatment" of seed increases the subsequent crop—a result borne out by our own experiment. As a preliminary all the seed potatoes are emptied out on the ground and potato bags are taken and soaked in water. The potatoes are cut into 2oz. "sets" and these "sets" are placed back in the soaked bags. The wet bags of cut "sets" are left in a cool place for a period of 24-48 hours prior to planting or until such time as it takes for the cut surface to gradually callous over. It is found that a hard layer of "suberin" or corky material will form in the cut tissues. This layer stops the leaching of cell sap from the cut potatoes and also prevents the introduction of bacterial or fungoid troubles into the "set." It was found that over a series of twelve plots, each of which received the same manuring, six of which had been sown with "treated" seed and six with "untreated," that the balance of yield in favour of the "treated" seed was 1 ton 19cwt. 1qr. 4lbs., or approximately 2 tons per acre.

Also in view of the fact that many growers are of the opinion that potatoes can be grown successfully with super. and an application of sulphate of ammonia as a top dressing, this practice was tried out over four plots. The general average of the rest of the plots of the experimental area was taken and this gave a yield of 218lbs. per plot, or a yield of 9 tons 14 cwt. 2qrs. 16lbs. per acre. This yield includes that from six plots in which a manure containing no potash was used. The yield obtained from the use of super in the furrow and an application of sulphate of ammonia as a top-dressing gave a return of 172lbs., or a yield of 7 tons 13cwt. 2qrs. 8lbs., a difference of 2 tons 1cwt. 1qr. 8lbs.

Another two plots were manured with a commercially blended non-potash fertiliser. The return from these plots was only 137lbs. per plot, or at the rate of 6 tons 2cwt. 1 qr. 8lbs. per acre. This agrees with the results obtained from the adjacent commercial crops where a yield of only 3½ tons per acre was dug.

Summary.

1. There seems to be a possibility that an increase of super. above 1,430lbs. per acre (the weight in our standard control) may be economically sound. In other words the value of the crop will more than equal the increased cost of the manure.
2. In this particular class of soil the "effective" amount of sulphate of ammonia would seem to be approximately about 200lbs. per acre.
3. An increase of potash tends to an increase in yield and quality of the crop.
4. That top dressing with sulphate of ammonia when the crop is just breaking ground is not so successful when super. only is used at planting as the same quantity of each applied in the furrow at planting.
5. The "wet bag" treatment not only materially assists germination but likewise induces a heavier yield, but the reason is not determined.

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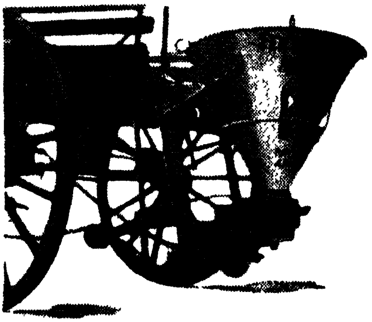

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THE TANGIER PEA.

G. K. BARON-HAY, B.Sc. (Agric.),
Assistant Superintendent of Dairying.

Introduction.

The Tangier Pea (*Lathyrus tingitanus L.*) is an annual indigenous to Northern Africa, but has been grown as an ornamental plant in Europe for many years.

It was first recommended and grown as a fodder by Dr. Trabut, of Algeria, where it is used as winter forage. It is cultivated also in the Canary Islands and Morocco

Although first introduced to the United States in 1900,[1] it was not till some 20 years later that its great value as a fodder and green manure crop was recognised, and C. V. Piper, United States Department of Agriculture, reports in 1922[2]:—"It has given the largest yields of green matter to the acre of any annual legume grown in California. The dense growth chokes out weeds completely. It is a good green manure crop, but the seed has been hard to get. There is hope that this difficulty may be overcome."

The Tangier Pea is also cultivated as a fodder plant in the South of France, where it is said to be very hardy and able to withstand a temperature as low as 26 degrees Fahrenheit. In this connection P. de Sornay[3] reports:—"It is a first class fodder plant and thrives very well. It is sown at the beginning of the rains, and its stems rapidly cover the soil. Cattle eat it readily. Attempts should be made to acclimatise this legume in various sub-tropical countries."

Mr. W. E. Barker,[4] Sequin, Washington, writes in 1923:—"I grew the Tangier Pea on the poorest pieces of land on the farm—land that had been cropped to wheat for fifty years. It grew about 7 feet high and made an impenetrable jungle."

On reading these eulogistic reports, it was thought possible that the Tangier Pea would fill a useful place in the agriculture of this State, and a small packet of seed (2 ounces) was secured through the courtesy of Professor P. B. Kennedy of the Agricultural Experimental Station, California. These seeds were distributed amongst the State Experiment Farms at Nabawa, Merredin, Wongan Hills, and Denmark, and also Mr. A. T. O'Connell, Dwarda.

Description.

The Tangier Pea (*Lathyrus tingitanus*) is an annual, which in general appearance and growth resembles the ornamental Sweet Pea.

The plant shows slow growth during the winter months, but as warm weather approaches the growth is very rapid and strong, and during September the plant quickly attains a height of from 3 to 7 feet, in a tangled mass, producing a dense covering which chokes out all but the strongest weeds.

The Tangier Pea is drought resistant to a high degree, owing to its deep-rooting habit, the roots also having numerous large nodules.

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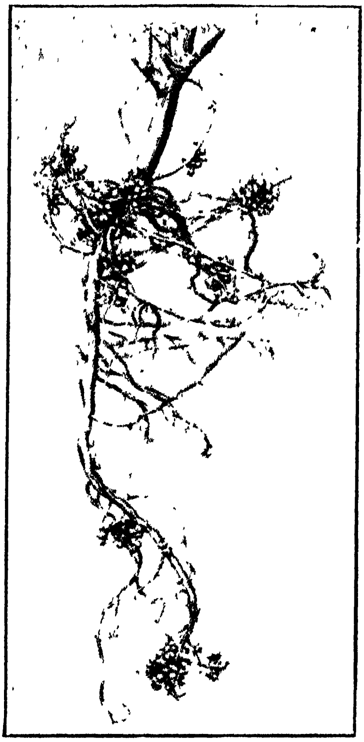
1. Ball, C. R.; Grasses and Fodder Plants on the Potomac Flats, U.S. Dept. Agriculture, 1900.
2. Piper, C. V. and Pieters, A. J.: Green Manuring, U.S. Dept. Agriculture, Bulletin 1250, 1922.
3. P. deSornay: Green Manures and Manuring in the Tropics, 1916.
4. P. B. Kennedy: The Tangier Pea. Univ. of California. Circular 290, 1925.

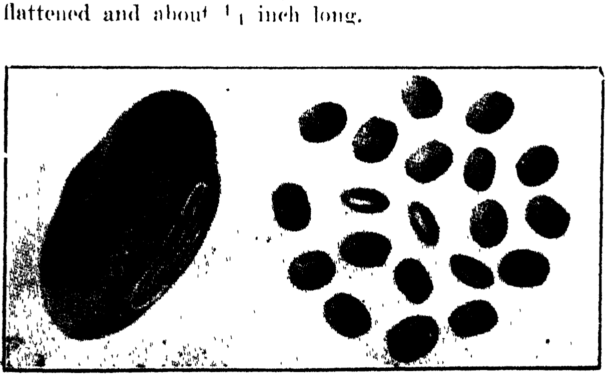
The plant is smooth, with coarse flattened stems and prominent stipules. The leaves consist of a pair of large lanceolate leaflets, the midrib of the leaf terminating in a much branched tendril by which the plant supports itself.



Showing deep rooting habit, with numerous nodules.

The flowers resemble Sweet Pea blossoms but are small and scarlet in colour. The clusters bear generally two, sometimes three, blooms.

The pods are about 3 inches long, containing 5-8 seeds which are brown, elliptical, flattened and about ¼ inch long.



Seeds of Tangier Pea. Enlarged and natural size.

Result of Trials in Western Australia.

Mr. A. T. O'Connell, Dwarda

Rainfall	May.	June.	July.	August.	Sept.	Oct.	Total Useful Rain.
1926	426	418	950	270	361	371	27·96
1927	265	709	494	323	257	260	23·08

100 seeds were supplied to Mr. O'Connell in May, 1926.

Soil: Well drained clay loam.

Planted: Second week June.

Growth very slow and straggly till middle of August, when colour became healthy and plants attained a height of 6 feet on 28th November, at which time it was in full bloom.

The crop was quite green and succulent on 10th December, after this date ripening commenced, and the crop was quite ripe by the end of December.

Seed obtained: 10lbs. 2ozs., a remarkable yield from about 1 ounce of seed.

Results, 1927:

Mr. O'Connell, the following season, planted ¾ acre with Tangier Pea under field conditions.

Soil: Clay loam to light sandy loam.

Planted: 30th April, with a drill.

Fertiliser: 138lbs. superphosphate per acre.

Seed: 8lbs. per acre.

May 12th: 1½ inches high.

May 22nd. First pair of leaves opened. Tendrils on some.

June 5th: 6-9 inches high. Second shoots appearing.

July 13th: Runners 10 inches long.

Aug. 8th: Peas very healthy colour. Runners 20 inches.

Aug. 31st: Stooling freely.

Oct. 22nd: Growing strongly, 2ft. 6in.-3ft. high. Few flower buds showing.

Oct. 30th: 4 feet high.

Nov. 6th: 5ft. 9in. high. In full bloom. Growing strongly.

Nov. 13th: 6ft. 6in. high.

Nov. 20th: 6ft. 8in. Some 7ft. 5in. Full bloom passing. Still quite green.

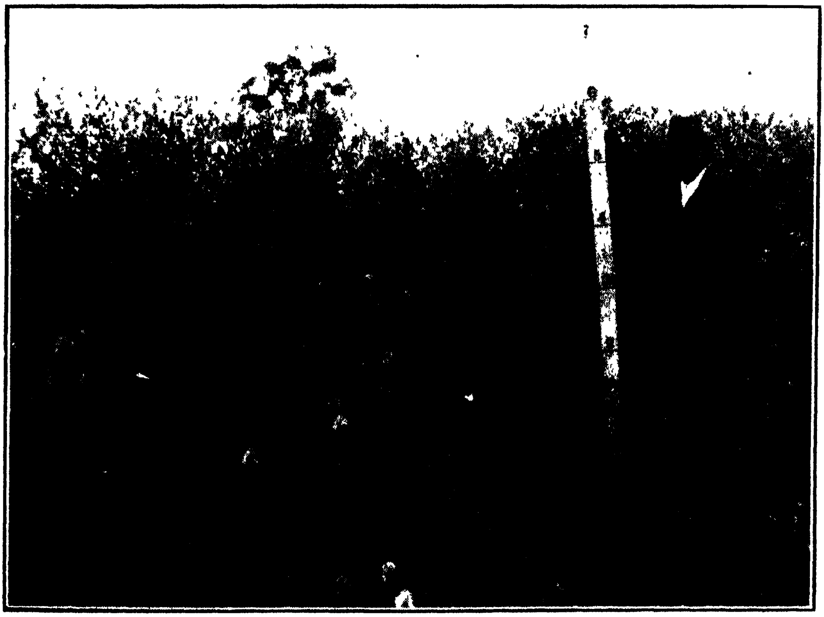
Wheat was being stripped alongside the field trial, while the Tangier Pea was still green and blooming.

A late crop, sown on July 16th, had 80 per cent. germination in thirteen days, in spite of heavy frosts. This crop remained green up to Christmas time.

MERREDIN EXPERIMENT FARM.

Rainfall.	May.	June.	July.	August.	Sept.	Oc	Total Useful Rain.
1927	53	164	132	89	167	[illegible]	6·69

Field Trial with Tangier Pea, 1927. Mr. J. T. O'Connell's Farm, Dwarda. Photo taken 29th November.



Field Trial, Dwarda, 1927. Note dense tangled growth which choked out all weeds.

"Planted 20th May, 1927, but did not germinate till towards end of June. Germination poor and growth during winter months slow and weakly. With warmer weather, growth became more rapid. The plants are still quite green (Nov. 10th) and evidently require a fairly long season to mature."

WONGAN HILLS LIGHT LANDS FARM, 1927

Rainfall	May	June.	July	August.	Sept	Oct.	Total Useful Rain.
1927	143	221	260	89	57	50	7 86

Soil: Light sandy, smoke bush country.

Planted: June 8th on land fallowed June, 1926.

Fertiliser: 1cwt. superphosphate per acre.

Germination slow, 60 per cent.; remainder germinated in spring.

Growth very rapid during September and October; stalks varying from 7-20 on each plant, being from 2 feet to 3 feet 6 inches in length.

Nov. 11th: In full bloom; plants green and succulent.

The Superintendent of Wheat Farms (Mr. I. Thomas) considers these results very promising, especially on such a light soil, and the plant may provide a means of lengthening the period during which green fodder is available.

As a Forage Plant.

As some guide to the feeding value of the Tangier Pea, samples of the plant were submitted to the Government Analyst (Dr. E. S. Simpson) for analysis.

The following table shows the Tangier Pea compared with White Dutch Clover and the Common Vetch:—

— —	Water	Ash	Crude Protein	Carbohydrates.		Fat
				Fibre	Nitrogen. Free Extract	
White Dutch Clover	8 1	8 0	16 2	23 2	41 6	2·9
Vetches (common)	7 1	8 2	17 3	26 2	38 7	2 8
Tangier Pea	6 36	6 12	17 94	25 12	40 62	3 84

It will be seen that the Tangier Pea closely approximates to the values of these two legumes, as revealed by chemical analysis.

Mr. O'Connell reports that the Pea is relished by all stock, which smashed a fence against which the plants were growing in order to reach them.

The leafage and stalks are eaten by stock, and, in Algeria and California, where considerable quantities have been fed to stock, no deleterious effects have been recorded.

TANGIER PEA STRAW

— —	Moisture.	Ash	Crude Protein.	Carbohydrates.		Fat.
				Fibre.	Nitrogen. Free Extract.	
1.—Bean Straw	11 07	6·97	5 68	41·10	33·63	1·52
2.—Oaten Hay	8 6	4 7	3·80	31 0	49·2	2·6
3 —Oaten Straw (Stubble)	11 5	5·4	3 60	36·3	40·8	2·4
4 —Tangier Pea Straw	10·00	10 64	6 42	37 10	34·06	1·78

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1 Hendry, G. E., Bean Culture in California Bulletin 294. California Agricultural Experiment Station

2 West Australian figures.

3 Henry and Morrison Feeds and Feeding.

4. P B Kennedy The Tangier Pea Circular 290 University of California.

Value of Straw.

Mr. O'Connell has found that all stock—sheep, horses, and cattle—eat the Pea straw with relish, cattle in particular being very keen on it.

While it is not advisable that the straw should be considered suitable as a feed for stock, by itself, there is no doubt that the straw, when chaffed, would make a valuable bulk feed, especially for cattle.

The following comparisons of Tangier Pea straw with Bean straw, Oaten hay (local), and Oaten stubble indicates that the Tangier Pea straw has a decided feeding value and compares more than favourably with Oaten stubble.

For feeding to cattle it is advisable to chaff the straw and moisten it some hours before feeding.

A crop ready to harvest. The straw is fine and relished by stock.

Summary.

1. The Tangier Pea shows great promise as a fodder plant and for green manuring in districts with 16 inches winter rainfall or over.

2. Early autumn planting, in April or early May, is recommended.

As the plant grows but little during the cold winter months, this early planting is important.

3. The plant requires 6-7 months to reach maturity, and in districts indicated in paragraph 1 above should lengthen the period during which green fodder is available by at least six weeks.

4. Grown with oats, it gives promise of being an excellent crop for silage.

A limited number of sample packets of seeds are available for distribution to farmers wishing to try this crop, on application to the Director of Agriculture, Department of Agriculture, Perth.

TOXIC PARALYSIS OF SHEEP.

H. W. BENNETTS, M.V.Sc.,
Veterinary Pathologist.

In the last issue of this *Journal* (December, 1927), a short description of the condition termed "toxic paralysis of cattle" was given. Though this condition of *carrion* poisoning commonly affects cattle, it has not previously been described as affecting sheep in this State, and only rarely in other localities.

Recently sheep mortality due to this cause has been brought under our notice, and as the condition, which is a characteristic one, may be more common than reported, a description is merited.

History.--The mortality occurred in a property in the Merredin district during the month of January of this year. The total flock, run in one mob, consisted of 400 mixed sheep. For some weeks the sheep had been depastured in a wheat stubble paddock; shifting to an adjoining stubble paddock did not prevent deaths.

Losses had been occurring for some three weeks prior to visit of inspection; twelve sheep had died and three were found sick. In every case where symptoms had been observed death had occurred. All the sheep were in good condition, the affected sheep were almost invariably the fattest and usually wethers, viz., those most likely to forage.

Both stubble paddocks, on which sheep were depastured, contained rabbit warrens which had been treated with carbon bisulphide during the winter months. Rabbits, apparently, had recently dug out many of the burrows and unearthed numerous old rabbit carcases.

Sheep were seen to be eating these, and there was evidence that they had been doing so for some time.

Cause.---This fact, combined with the characteristic symptoms shown by affected sheep, was evidence that the trouble was due to the ingestion of rabbit carcases containing a toxin-producing organism (*Bacillus parabotulinus* or *Bacillus botulinus*). Apart from presence of rabbit carcases there was nothing abnormal about pastures. A diagnosis of Toxic Paralysis or *Carrion* Poisoning was accordingly made. This was subsequently confirmed by bacteriological tests. It is noteworthy that toxic paralysis affecting cattle following ingestion of rabbit carcases is known in the district.

Symptoms.---The initial symptoms are a wriggling of the tail as though fly-blown, followed by inability to eat or drink; the head being held in a drooped position, the lower jaw hanging down, and from the open mouth there is a more or less continuous and profuse flow of frothy saliva. The gait is stiff and the animal appears dull. Constipation is present and urine comes away in dribbles. In advanced cases there is a difficulty in breathing, the respiration being spasmodic and abdominal owing to partial paralysis of chest muscles. Affected animals frequently lie down, and towards the end are unable to get up, and die quietly without a struggle, in normal lying-down position.

In this outbreak the condition was a very acute one—death occurring within several to 24 hours after symptoms were first noticed. It is quite likely that sheep eating smaller amounts of carrion or carrion containing less toxic material might show more chronic or indefinite symptoms as described previously for cattle.

Forage poisoning should be suspected in sheep mortalities where members of the flock have previously been noticed to have a depraved appetite, manifested by ingestion of carrion, etc.

Post Mortem.—There are no characteristic changes to be found in a fresh carcase dead from this disease (putrefaction of sheep carcases is rapid particularly during the summer). The gall bladder in one case examined was enlarged and the kidneys slightly congested. Remnants of bones, etc., may be found in the stomachs.

Treatment.—There is no satisfactory treatment.

Prevention—

1. Remove depraved appetite by supplying the minerals lacking in diet in form of a lick:- Bone meal 4 parts, Salt 1 part.
2. Collect all bones, rabbit and other carcases from pastures, and destroy by burning.

CAULIFLOWERS.

J. C. PALMER, Dip. Agric.,
Potato Inspector.

There is always a good demand for cauliflowers in the markets. It is a vegetable that is not very easy to grow and consequently the householder is apt to rely on the local market for supplies rather than the home garden. Climate, soil conditions and the amount of available water are all important factors, which tend to make or mar a successful crop of cauliflowers. Since the edible part is the "head" or "flower," special precautions have to be taken to ensure that the cauliflower is marketed in the most attractive manner possible. It is the care and attention necessary to keep the "head" white which makes the cultivation a difficult matter. The successful grower is the one who grows systematically and carefully over a period of years. Such a grower will average a good price for his crop over a period of time in spite of the fluctuations of market which must of necessity occur by reason of the variations of supply and demand.

Soil.--The best type of soil for the cultivation of cauliflowers is one which has been well worked up and is rich in organic matter. Well drained river flats or alluvial flats are very suitable. Cauliflowers will grow on very light soils provided that a heavy dressing of organic manure is worked through them thoroughly. Experienced gardeners rarely plant the centre of a peaty swamp but prefer to make use of the outside edges of such land In many places cauliflowers are used as a following crop after early potatoes. This is a good practice, for the land must be well worked and kept free from weeds to ensure the harvesting of a good potato crop.

Seed and Seedlings.--Seed is one of the most important factors in the production of a good crop. In the Eastern States the growers pay very high prices for their seed, and in some cases as much as £3 per lb. has been paid. Cheap seed means that a large proportion of useless plants will be obtained. Further, the cauliflower seed has been obtained as the result of careful breeding and selection on the part of the specialists, and so of necessity must be fairly costly. It is better to buy seed from good and reliable seedsmen rather than to save seed from the growers' own plants and strain Cauliflower seed should be from known strains and have a germination capacity of at least 90 per cent. Since there is little, if any, difference between seed which is one or two years old, many growers order twice as much seed than is necessary for their requirements. In the event of a good crop of high quality cauliflowers being obtained from the first sowing then the surplus seed can be used in the following season. It is usual to plant the seed in beds. These beds might be arranged so that it is possible to weed them from either side. A bed 20ft. x 4ft. will provide enough plants for planting an acre. The seed can be broadcasted, and in practice it is found that ¾lb. will provide enough plants for an acre. If the seed is drilled, allow a distance of 4in. between the rows and 1oz. seed should sow a length of 200ft. Other growers plant their seed in boxes. After planting, cover the seed to a depth of about ½in. only. The surface of the seed bed must be kept firm and moist. For early crops it is possible to sow during December, and late crops up till June, but it is better that the main crop be sown about February, provided the weather conditions are suitable. This main crop will be ready in June and July. When the young plants are about 1in.-1½in. high they should be dusted with a mixture of air-slaked lime and tobacco dust (in the proportion of slaked lime 2 parts, tobacco dust 1 part). This mixture can be dusted over the plants in the early morning when the plants are moist with the dew. The mixture acts as a deterrent against insect pests. Applications can be made through the seedling stage till the plant is starting to "head" in the field. "Damping off" is also more common in over-crowded, over moist and poorly cultivated beds. Frequent light waterings consequently are not as beneficial as thorough wettings at longer intervals. The beds should not be watered on very hot sunny days. The beds must be kept well weeded and the surface stirred frequently, hence there is a distinct advantage derived in drilling the seed in rather than in broadcasting it over the seed-plots. In moderation, sunlight is a fine preventative against this disease which seems so prevalent amongst young cauliflower plants. It is also desirable to use, if possible, fresh seed beds every year to minimise the danger of "damping off" and other seed bed diseases.

The care taken in raising good stocky healthy plants means the success or failure of the crop grown in the field. The grower who grows his own seedling plants is surer of the strain of his plants than the grower who is content to buy his seedling plants from the local seedsman. In successful cauliflower growing the "strain" of the plants is very important.

Transplanting. The seedling plants are ready for transplanting when they are about 4in.-6in high, or about the fourth leaf stage. The seedling plants should be raised and if possible a ball of earth left round the rootlets of each plant. The young plants, after being placed in a box, are covered with wet hessian The box of seedlings is carried along the planting row, in front of the planter, and the plants dropped in position. The planter follows up and each plant is dibbled in. The plants should be well watered after planting. It is better to choose a dull, cloudy day or towards evening for planting to allow the seedling to get over the shock of the transplanting. Some growers recommend that the seedlings in the seed-bed be allowed to harden somewhat by withholding water from them just prior to transplanting. This also renders the plants less flaccid or "watery." The plants are then set out in rows 3ft. apart and 2ft. to 3ft. in the rows. Hot weather during transplanting may tend to check the seedling plants very much: this should be avoided as much as possible. It is estimated that 5,800 plants per acre are necessary to plant an acre at 3ft. apart and 2ft. 6in. in the rows; 4,840 at 3ft. in the rows.

Manuring.—The cauliflower is a gross feeder and will respond to heavy dressings of manure. The best manure is, of course, well rotted farmyard manure. Growers in England use up to 20 tons per acre. Unfortunately there is not a large quantity of farmyard manure available in many parts of this country, so artificials must be used. A useful manuring is 9 cwt. super, 1 cwt. sulphate of potash, 1½ cwt. sulphate of ammonia per acre, applied in the furrow. Follow with a top-dressing of ½ cwt. nitrate of soda per acre when the plants are well established. If the plants are making a slow growth, or if they appear yellowish green, add further dressings of nitrate of soda at the same rate.

Cultivation.—The ground should be rolled after planting, and well cultivated between the rows. Cultivation will keep down the weeds and so there will be no wastage of the manure. Cultivation can be done with horses till the plants are too big, then hand hoeing should be done whenever necessary. Where the plots are irrigated the watering should be carefully regulated. Frequent light irrigations (by overhead sprinklers) will tend to encourage surface rooting and also will help to check damage by insect pests. The main consideration is to keep the plants growing without a check. The faster and the more uniform the plants grow the better will be the crop. The most anxious period for the grower is just prior to the maturing period. Excessive heat at this time will cause yellowing or fuzziness of the head.

Defects.—Cauliflowers only fetch good prices when the head is free from certain well defined defects. These defects in the head are quite obvious and should be eliminated wherever possible. A very common fault is *over-maturity,* which can be obviated only by cutting slightly immature cauliflowers. Sometimes the head has a granulated appearance. This *riciness* is likely to occur when the crop matures during exceptionally warm weather. Some varieties of cauliflowers are subject to this fault and such strains should not be grown. Sometimes small green leaves appear between the segments. *Leafy head* is due to the use of low quality cauliflower seed and can be avoided by using high grade seed. Cauliflowers are cut to arrive on the market with the outer leaves green and the head a clear white colour.

In order to keep the head a nice attractive white colour, it is necessary to protect the head from exposure to too much weather, either sun, rain or frost. This is usually done during the growing period. Some growers break off a few of the larger outside leaves and place them over the head. Others bend over the larger inner leaves, then tie the outer leaves together with a band.

Harvesting.—Since cauliflowers must be cut when ready the crop will have to be examined every day towards the end of the growing period to ensure that as the heads become ripe they may be cut off about 3in. below the head. All the leaves, with the exception of those which are yellow or dirty, are usually left on to avoid damage of the head in transit. It is usual to cart the cauliflowers direct to the packing shed, so that they are left out in the sun as little as possible. Growers have obtained up to 400 dozen of cauliflowers per acre, and in the ordinary season this should prove a very remunerative crop.

Varieties.—A good seedsman can be relied on generally to supply high grade seed. Local experience is, however, the best guide to the varieties which may be planted. A few of the many varieties are—

Early Snowball—a very early variety, with a small compact head with a fine white attractive looking curd.

Eclipse—a summer variety which will stand dry, hot weather.

Early London—a large and hardy variety.

Veitches' Autumn Giant—one of the largest and best type of cauliflowers.

Dwarf Erfurt—a favourite variety with many growers.

FALLOW COMPETITION.

WYALKATCHEM AGRICULTURAL SOCIETY.

Judge—A. S. Wild, B.Sc. (Agric.), Agricultural Adviser.

Twenty entries were received for this competition. Of these, eleven submitted fallow for inspection.

The awards made are set out hereunder.

FALLOW COMPETITION.

WYALKATCHEM AGRICULTURAL SOCIETY.

Judge—A. S. WILD, Agricultural Adviser.

Competitor.	District.	Moisture.	Mulch	Weeds.	Consolidation of Seed Bed.	Uniformity of Preparation	Total
		40 pts.	10 pts.	10 pts.	20 pts.	20 pts	100 pts.
Tyler, J. F.	Korrelocking	28	9	9	16	17	79
Threlfall, G.	Korrelocking	26	9	8	16	18	77
Ferries, H.	Wyalkatchem	26	9	8	16	16	75
Davies, W	Benjaberring	26	9	7	15	17	74
Robinson, S. W.	Cowcowing	28	8	9	14	15	74
Lindsay, J.	Wyalkatchem	26	8	8	15	16	73
Lehman, C. F.	Cowcowing	26	8	9	14	15	72
Bowles, J	Wyalkatchem	28	7	7	14	15	71
Hall L. H.	Cowcowing	26	7	9	14	15	71
Hodgson, H.	Korrelocking	26	7	9	14	15	71
McKay N.	Benjaberring	24	6	9	15	15	69

The cultural details, etc., of the various fallows inspected are as set out in the table hereunder:—

FALLOW COMPETITION.

WYALKATCHEM AGRICULTURAL SOCIETY

Competitor.	J. E. Tyler	G. Threlfall	H. Ferries	W. Davies	S. W. Robinson.
Timber	Salmon, Gimlet, Ti-tree and Mallee	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet with variations
Ploughed	June	Early in June	June	July	July.
Make of Plough	Mouldboard	Mouldboard	Mouldboard	Sundercut	Disc
Depth	8 to 4 inches	4 inches	3½ inches	3 to 3½ inches	4 inches.
Condition of land at time of ploughing	Good	Good	Good	Good	Good.
Other cultivations	Disc ploughed in September and Springtyned in October	Scarified both in the middle of and at the end of September. Cultivated with Combine second week October. Harrowed 19th Nov. after 25 points of rain. Sheep run on fallow during Aug. and Sept.	Skimmed with Sundercut during August. Springtyned with duckfoot points at end of September. This was repeated during Jan. Sheep were run on the fallow	Springtyned in September	Cross cultivated in August. Harrowed in September. Part received extra harrowing during the Spring.

FALLOW COMPETITION—*continued.*

Competitor	J. Lindsay.	C. E. Lehman.	J. Bowles.	L. Hall.	H. Hodgson.	N. McKay.
Timber	Salmon and Gimlet	Salmon and Gimlet with variations	Salmon and Gimlet	Salmon and Gimlet	Salmon, Gimlet and Titree	Salmon, Gimlet and Titree.
Ploughed	July	July	June	June and July	July	End of August.
Make of Plough	Mouldboard	Disc	Mouldboard	Mouldboard	Sundercut	Disc.
Depth	4 inches	4 inches	4 inches	4 inches	3½-4 inches	3 inches.
Condition of land at time of ploughing	Good	Good	Good	Good	Good	Good.
Other cultivations	Cultivated with a wide point cultivator during Sept. Sheep were run on the fallow	Cross cultivated at end of August with Combine. Harrowed at end of Sept.	Skim ploughed with Sundercut in Sept. to a depth of 2½in. A small part had an extra Springtyning	Ploughed with Sundercut to a depth of 2in. in Sept.	Cultivated with Combine second week in Aug. This repeated at end of Aug. A small portion cultivated later	Early in September it was skim ploughed. Sheep werle run on falow.

All the fallows inspected were very free of weed growth and very dry. The long, dry spell placed the heavy land at a disadvantage as regards moisture content when compared with the competing areas, which included lighter soil.

The winning fallow, that of Mr. J. E. Tyler, was on mixed country, salmon gum, gimlet, ti-tree and mallee being the original timber. It was ploughed in June, 1927, to a depth of three to four inches with a mouldboard plough, disc ploughed back to a depth of two inches during September and springtyne cultivated in October. At the time of inspection, the fallow presented a very even, clean appearance. The work on it appeared to have been carefully carried out. The land had been ploughed to an even depth and a level bottom secured. The subsequent cultivations had produced a good, even mulch, two to two and a half inches deep. The attractiveness of this fallow was somewhat diminished by the appearance resulting from the soil variations.

The entry of Mr. G. Threlfall, which was on salmon and gimlet country, had also been well prepared. The land had been ploughed during the first week in June, 1927, with a mouldboard plough to a depth of four inches. It was scarified during the middle of September and again at the end of that month. During the second week in October it was cultivated with a springtyne implement and on the 19th October, after 25 points of rain, it was harrowed. Sheep were pastured on the fallowed land during August and September.

The operations connected with the preparation of this fallow had been most carefully done. It, however, lost points for moisture and was marred somewhat by the presence of "prickly summer weed" (*Solanum hoplopetalum*), and Cockspurs, which, fortunately, were not numerous.

Mr. H. G. Ferries' entry was very creditable. It had been ploughed during June with a mouldboard plough to a depth of three and a-half inches. In August it was skim ploughed with a sundercut and at the end of September, cultivated with a springtyne cultivator, fitted with wide points. This last operation was repeated during January. The resulting fallow was clean of weed growth, save for some "prickly summer weed." Although stated to be three and a-half inches, the depth of ploughing varied somewhat.

The fallowed area entered by Mr. W. Davies had a nice even mulch, except on odd hard patches. A quantity of "prickly summer weed" was present over the surface. Except for this, the land was clean of weed growth and roots. The appearance of this fallow was detracted from by the presence of a pad formed by stock moving over one portion.

Mr. S. W. Robinson's entry was part of 120 acres of clean fallowed land. Although stated to be four inches, actually the depth of ploughing varied. This was also the case with Mr. C. E. Lehman's entry. Here, also, the weeds appeared to have been dealt with in a satisfactory manner.

Except for "prickly summer weed," Mr. J. Lindsay's fallow was comparatively free of weed growth. Sheep had been pastured on this land subsequent to the September cultivation. This practice, so often adopted by the leading farmers of the State, is no doubt responsible for the absence of weeds on many fallows throughout the Wheat Belt. A few roots were noticed on the surface of this particular fallow, which could to advantage have been ploughed to a more even depth.

The surface of Mr. J. Bowle's fallow was ridged and lumpy in places. On the lighter portions, the ploughing had been deeper than on the heavier. In the sandier portions of the fallow moisture was still visible close to the surface. Weeds, including Cockspurs and Capeweed, were noticed over this fallow.

The initial ploughing of Mr. L. Hall's fallow had been done thoroughly, except on odd hard patches. It is to be regretted that this fallow did not receive more subsequent cultivation. On certain portions the surface presented a very lumpy appearance. Improvement would also have been effected by picking up the few roots brought up by the plough.

A later cultivation would have produced a much better fallow entered by Mr. H. Hodgson. The subsequent rain had, to a large extent, destroyed the mulch. A small portion which had received an extra cultivation, demonstrated the benefit which would have resulted if the whole had been treated in the same manner.

The entry of Mr. N. McKay was fallow on mixed salmon, gimlet, ti-tree and scrub country. It was ploughed at the end of August to a depth of three inches with a disc plough. Early in September this was then skim ploughed back and left. Sheep were pastured on the fallow to keep down weed growth. The result was that when judged, the fallow presented little or no mulch The September rains had beaten down the surface and the sheep running along the wheel marks left by the plough had not improved matters. This fallow was, however, very clean of weeds and roots. Cultivation subsequent to the second ploughing would have effected a great improvement.

JUNIOR FIELD TRIALS, 1927.

MERREDIN EXPERIMENT FARM.

E. J. LIMBOURN.

Wheat.

This experiment, which is planted with a seed-drill, was located with the other Feld Experiments in the main cropping paddock. The details relative to the method of conducting this Experiment were published in this Journal in March, 1927.

The experiment was planted on May 27th, the ground being in excellent condition at the time, excepting that sufficient moisture was lacking for a ready germination. Rain did not fall until early in June, no plants showing up until June 16th. Germination throughout was very good.

During the growing period the rains were light but fairly regular, keeping the plants growing steadily all the time. Leaf rust was much in evidence on all varieties. With the September rains, stem rust showed up, the late varieties were, however, the only ones affected by it, and it is possibly due to this that their grain yields were low. It will be noticed that in all of the late varieties the comparative hay yield is very much higher than the comparative grain yield.

The results show again that varieties maturing later than "Nabawa," our standard mid-season variety, are not suitable for heavy soils with a light rainfall.

The experiment included 25 varieties, with Gluyas Early as the control variety.

Of these, 11 were varieties received from the Eastern States, all. with the exception of "Bena" having given good results in the Test Rows. "Bena" was again included, on account of exceptionally good results published from the Eastern States. This is the third year it has been included, 1925 being the only year with satisfactory results. 1925 was a year with very low winter rains and an exceptionally dry August, followed by good spring rains in September and October. Early varieties that year had been forced to maturity too early, resulting in low yields, later varieties benefiting by this and the later rains. It is quite evident that no abnormal yields can be expected from "Bena" or any late maturing variety under our conditions. During the 3 years this variety has been tried the percentage yields of grain have been:—1925, 94; 1926, 63; 1927, 53 Average, 70. The remainder of the varieties under test (14) were un-named crossbreds from the Chapman and Merredin Experiment Farms. Nine of the Merredin crossbreds (Nos. M23 to M32) are still under selection in the Test Rows being included in the Field Trial as a test of their probable yielding capacity. It will be noticed that with the exception of M27, they have all given fairly satisfactory results, ranging from 88 per cent. to 98 per cent. of the Control variety for grain yield. This, in conjunction with their high resistance to disease, gives every promise of some useful varieties, suitable to W.A. conditions, being obtained. Of the older crossbreds, M14 to M21 and C49, only the two very early maturing varieties M14 and M18 are worth testing further at Merredin. M21 would no doubt be useful as a hay variety, but it is doubtful if there is sufficient need for a purely hay variety. Its quality is not exceptionally good, height and weight being its chief characteristics. C49 evidently requires a better rainfall.

Herewith a few brief notes on the characteristics of varieties from the Eastern States :—

Bena, P1614 (N.S.W.).—Quite unsuited to conditions in the lighter rainfall districts. Owing to the general lack of good spring rains it is doubtful if satisfactory yields would be obtained over a number of years in any portion of our wheat belt. It is very susceptible to most diseases, Bunt, Flag Smut, Rust and the take-all diseases having all been found. Maturity Late midseason, early growth slow and spreading.

Bunge No. 1 x Emmer, P1451.—This is a Queensland crossbred, unnamed, with a remarkable capacity for stooling. The ear is, however very small, which probably accounts for its low yield.

Although fairly short in the straw (40in.) its hay yield was slightly better, due to abnormal stooling. In quality of hay it is poor.

Its usefulness lies in its possibilities for crossbreeding, which it is intended to test as early as possible. Maturity, very early.

Confederation, P.1696 (Victoria).—A medium short-strawed variety, requiring a moderate to good rainfall.

Very susceptible to Bunt, but shows marked resistance to Flag Smut. Slightly affected by rust this season. Maturity, Late.

Ghurka, P1713 (Victoria).—Although yields this season were low this is certainly the best of the newer varieties from Victoria. Being short strawed it should stand up to windy conditions at harvest time, and shows no liability to shed its grain.

It is fairly resistant to disease, the tests with Bunt and Flag Smut being very satisfactory. Rust was noticed on the straw but the grain did not appear to be affected to any great extent. It apparently requires a fairly good rainfall and is not recommended for heavy soil where the rainfall is light. Maturity, Late.

Mogul, P1703 (Victoria).—A medium short strawed variety, that evidently requires a good rainfall. Results under field conditions here are very unsatisfactory, giving the lowest yield for both grain and hay.

It was rather badly infested with rust and gives very low resistance to both Bunt and Flag Smut. Maturity, Late.

Parsee, P1701 (Victoria).—A fairly good late hay variety of good colour and height. Grain yield badly affected by rust, and lack of spring rains.

Very susceptible to Bunt and Flag Smut. Maturity, Late.

Patriot, P1463 (Queensland).—This variety has given very satisfactory results both for grain and hay. The grain is of good quality, hay of good colour and height. It is very susceptible to Bunt, but was very clean from rust this season. Has not been tested for Flag Smut. Maturity, Early.

Rajah, P1710 (Victoria).—A very showy variety, stools well, but failed to yield up to expectation. Grain somewhat affected by rust, and of very poor quality.

It is fairly resistant to Flag Smut but susceptible to Bunt.

It has been tested for two years, but has yielded below 80 per cent. of the control variety Gluyas Early on both occasions It is evidently not suited to our conditions, heavy soil and low rainfall. Maturity, Midseason.

Rannee, P1697 (Victoria).—A medium short straw variety. Has given distinctly better results than Rajah, but is rather more susceptible to disease, Bunt, Flag Smut and Rust. Maturity, Midseason.

Sterling P1712 (Victoria).—Its comparatively high yield of hay combined with its medium height, suggests that it has great possibilties for grain under suitable conditions. Rust and late maturity, greatly affected its grain yield here this season, and it cannot be recommended for any of the light or moderate rainfall districts.

It is very susceptible to both Bunt and Flag Smut. Maturity, Late.

Waratah, P1627 (N.S.W.).—This has again given very satisfactory results, both for hay and grain. It stands very well against rough winds, but may be inclined to shed a little of its grain.

It is unfortunately very susceptible to both Bunt and Flag Smut, and was slightly affected by the rust attack this season. Maturity, Midseason.

The sections intended for hay were reaped by hand and weighed when cut and also after curing. The weights shown in the tables are those obtained after curing. The percentage yield given is the actual dry yield calculated as a percentage of the average yield of the two control varieties between which the other varieties were grown. The yields obtained are as follow:—

JUNIOR FIELD TRIALS, 1927 -WHEAT VARIETIES.

MERREDIN EXPERIMENT FARM.

HAY YIELDS

Weight of Sheaves after curing in Paddock.

Name.	Reg No	Section C.		Section E.		Section I.		Average percentage Yield.
		Actual Yield	Comparative Yield	Actual Yield.	Comparative Yield.	Actual Yield.	Comparative Yield	
		lbs	%	lbs	%	lbs	%	
Gluyas Early	P 159	11·50	100	12·25	100	11·50	100	100
Mogul	P1703	8·50	85	9·25	79	7·50	75	80
Sterling	P 1712	11·00	110	11·75	101	10·25	102	104
Ghurka	P 1713	8·25	82	8·75	75	8·25	82	80
Confederation	P 1696	9·50	95	12·00	103	10·00	100	99
Parsee	P 1701	10·25	102	11·00	95	9·50	95	97
Gluyas Early	P 159	9·50	100	11·00	100	9·50	100	100
Gluyas Early	P 159	10·50	100	12·00	100	9·50	100	100
Rajah	P 1710	9·00	81	8·75	77	8·50	86	81
Ranee	P 1697	9·00	81	10·00	87	7·50	76	81
Waratah	P 1627	11·00	100	11·25	98	10·00	100	99
Bena	P 1614	8·75	80	9·50	83	8·50	86	83
(Fortune × Gluyas E.)	C 49	9·25	83	10·00	87	9·25	93	88
Gluyas Early	P 159	11·50	100	11·00	100	10·25	100	100
Gluyas Early	P 159	10·00	100	9·50	100	10·00	100	100
Patriot	P 1463	9·00	91	10·00	98	8·75	89	93
(Dindiloa × Nabawa)	M 28	8·25	84	8·00	79	8·50	86	83
(Nabawa × Carrabin)	M 27	8·00	81	7·75	78	8·00	81	80
(Florence × Fortune)	M 32	8·50	86	9·00	88	8·75	88	87
(Gluyas Early × Nabawa)	M 31	9·50	98	9·75	95	8·50	86	93
Gluyas Early	P 159	9·75	100	11·00	100	9·75	100	100
Gluyas Early	P 150	9·50	100	10·50	100	9·25	100	100
(Dindiloa × Nabawa)	M 30	9·25	88	11·00	103	9·50	99	97
(Dindiloa × Nabawa)	M 29	9·50	90	10·00	94	8·75	91	92
(Nabawa × Carrabin)	M 25	9·50	90	8·25	78	8·75	91	86
(Florence × Carrabin)	M 24	8·50	81	9·25	87	7·75	80	83
(Federation × Carrabin)	M 23	9·75	93	10·00	94	9·50	99	95
Gluyas Early	P 159	11·50	100	10·75	100	10·00	100	100
Gluyas Early	P 159	10·00	100	10·00	100	9·25	100	100
Selection from Federation	M 21	10·00	96	11·00	101	10·00	105	101
(Nabawa × Sunset)	M 19	8·50	82	8·75	80	7·25	78	80
(Federation × Bunyip)	M 18	8·00	77	9·00	83	6·75	71	77
(Nabawa × Bunyip)	M 14	7·75	75	9·00	83	7·50	79	79
Bunge No. 1 × Emmer.	P 1451	10·00	96	11·00	101	9·75	105	101
Gluyas Early	P 159	10·75	100	11·75	100	9·75	100	100

The grain sections were harvested by hand and the sheaves threshed with the small machine thresher, care being taken to get the results as accurate as possible. After threshing, the grain from each variety was carefully weighed to the nearest eighth of an ounce, each section being weighed separately. From these weights the percentage yield of each variety was calculated, using the average yield of the two control plots to calculate that of each of the five varieties tested between each two controls. The yields obtained are as follow :—

JUNIOR FIELD TRIALS, 1927—WHEAT VARIETIES.

GRAIN YIELDS.

Name.	Reg. No.	Sectional Grain Yields. B.	D.	F	H.	J.	Average.	Comparative.
	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	%
Gluyas Early	P 159	48·375	40·250	48·875	48·500	48·625	46·925	100
Mogul	P 1703	17·875	17·000	18·625	18·125	20·125	18·350	41
Sterling	P 1712	29·125	28·250	28·875	29·125	34·625	32·000	72
Ghurka	P.1713	29·125	.	27·750	31·625	35·125	30·906	70
Confederation	P 1696	28·125	28·000	32·125	30·375	33·250	30·375	68
Parsee	P 1701	24·750	25·750	30·750	28·375	30·750	28·075	63
Gluyas Early	P 159	34·250	40·000	43·500	45·750	46·250	41·950	100
Gluyas Early	P 159	36·500	36·625	44·875	43·375	45·125	41·300	100
Rajah (Vic.)	P 1710	30·500	30·000	34·250	32·500	34·625	32·375	76
Ranee	P 1697	30·875	36·375	37·500	37·250	34·750	35·350	83
Waratah	P 1627	34·625	36·250	40·250	37·000	45·625	38·750	91
Bena	P 1614	18·375	22·125	26·125	23·750	21·750	22·425	53
(Fortune × Gluyas Early)	C 49	27·750	29·875	34·625	30·500	32·750	31·100	73
Gluyas Early	P 159	42·250	36·375	47·750	43·250	49·000	43·725	100
Gluyas Early	P 159	35·875	37·000	42·750	46·000	43·500	41·025	100
Patriot	P 1463	31·750	37·875	43·125	41·250	45·375	39·875	98
(Dindiloa × Nabawa)	M 28	31·875	39·125	40·750	40·500	45·875	39·625	97
(Nabawa × Carrabin)	M 27	26·000	24·500	27·250	28·000	31·375	27·625	68
(Florence × Fortune)	M 32	33·500	38·875	41·875	31·375	44·250	37·975	93
(Gluyas Early × Nabawa)	M 31	29·250	37·000	40·625	40·000	39·375	37·250	91
Gluyas Early	P 159	34·250	38·875	44·000	45·500	40·750	40·675	100
Gluyas Early	P 159	26·500	36·750	40·375	39·125	41·500	36·850	100
(Dindiloa × Nabawa)	M 30	27·750	35·750	38·375	36·000	41·125	35·800	91
(Dindiloa × Nabawa)	M 29	26·125	34·000	42·750	37·000	39·250	35·825	91
(Nabawa × Carrabin)	M 25	30·125	35·000	40·000	40·125	45·500	38·150	97
(Florence × Carrabin)	M 24	25·375	37·250	37·500	36·750	36·000	34·575	88
(Federation × Carrabin)	M 23	32·250	38·250	43·625	39·875	42·375	38·875	98
Gluyas Early	P 159	36·000	43·750	40·250	45·500	45·125	42·125	100
Gluyas Early	P 159	32·875	41·625	41·625	44·625	40·125	40·175	100
Selection from Federation	M 21	27·750	32·500	34·500	31·750	35·000	32·300	77
(Nabawa × Sunset)	M 19	23·250	26·375	31·125	31·000	29·625	28·275	67
(Federation × Bunyip).	M 18	33·625	35·250	36·625	35·375	39·625	36·100	86
(Nabawa × Bunyip)	M 14	30·000	33·125	36·250	34·625	37·875	34·375	82
(Bunge No. 1 × Emmer)	P 1451	28·500	27·375	33·875	35·250	36·375	32·275	77
Gluyas Early	P 159	36·875	44·875	47·750	43·750	45·875	43·825	100

TABLE SHOWING THE RELATIVE YIELDS OF HAY AND GRAIN.

Name of Variety or Parent varieties of Crossbreds.	Reg No	Maturity.	Height, Inches.	Hay Yield.	Grain Yield
Gluyas Early - Control	P 159	Early	45	100	100
Patriot	P 1963	Early	45	93	98
Waratah	P 1627	Mid.	43	99	91
Ranee	P 1697	Mid.	39	81	83
Bunge No 1 × Emmer	P 1451	Very Early	40	101	77
Rajah	P 1710	Mid.	40	81	76
Sterling	P 1712	Late	43	104	72
Ghurka (Short Straw)	P 1713	Late	34	80	70
Confederation	P 1696	Late	39	99	68
Parsee	P 1701	Late	43	97	63
Bena	P 1614	Late	38	83	53
Mogul	P 1703	Late	40	80	41
(Federation × Carrabin)	M 23	Early	43	95	98
(Nabawa × Carrabin)	M 25	Early	45	86	97
(Dindiloa × Nabawa)	M 28	Early	43	83	97
(Florence × Fortune)	M 32	Early	44	87	93
(Dindiloa × Nabawa)	M 29	Early	42	92	91
(Dindiloa × Nabawa)	M 30	Early	42	97	91
(Gluyas Early × Nabawa)	M 31	Mid.	45	93	91
(Florence × Carrabin)	M 24	Early	44	83	88
(Federation + Bunyip)	M 18	Very Early	38	77	86
(Nabawa × Bunyip)	M 14	Very Early	45	79	82
A selection from Federation	M 21	Early	47	101	77
(Fortune × Gluyas Early)	C 49	Mid.	41	88	78
(Nabawa × Carrabin)	M 27	Late	41	80	68
(Nabawa × Sunset)	M 19	Mid.	45	80	67

Oat Varieties.

The results of this experiment are rather more satisfactory for 1927 than in the previous season, the effect of weed growth having been to a great extent overcome.

The Oat varieties were planted alongside the wheat section of the Trials, but were drilled in on May 4th, about three weeks earlier. The Oat section therefore lacked the extra cultivation given to the Wheat, and which practically cleared the Wheat portion of Barley grass.

Owing to lack of moisture, germination was very patchy. At the time of planting there appeared to be ample moisture to germinate the grain readily, and it was probably due to the absence of rain after planting that germination only took place where the soil was free from clods.

Although irregular, the final germination was good, the majority of the seed not germinating until after the rains early in June.

The effect of the irregular germination, combined with the disadvantage of weed growth, could be noticed right throughout the growth of the plants. Sections B D and G, having the greater amount of weeds, were affected most, growth being shorter, maturity nearly two days later, and yields generally considerably below the other sections. The greatest variation in maturity was found in the depressions where the weed growth was greatest.

The control variety, ''Burt's Early," did not yield as well as usual, either for hay or grain, and most of the varieties under test compare very well with it. Quite a lot of its grain was shed before being harvested, although it was not left standing more than two days after it matured.

Mulga, the variety that has given the most satisfactory results for several seasons in the main variety trial, was included as a further means of comparison.

Hereunder are brief notes on the new varieties under test:—

*Buddah, P*1632 (*N.S.W.*).—A selection from Sunrise Oats by Mr. J. T. Pridham, of Cowra, N.S.W.

An early maturing variety, should prove a good oat for silage purposes, making good tall growth, and is very succulent. Does not break down as easily as Sunrise, gives a good yield of grain, pale yellow in colour, and as plump as "Mulga." A decided improvement on "Sunrise"variety.

Has been very free from disease on each occasion.

Palestine, P 1716.—A very short-strawed variety received from Werribee Research Farm, "Victoria."

Purely a grain variety, although it might prove useful for early feed. It is very quick growing, with a very strong young growth. Matures even earlier than "Burts Early."

Forms two grains of equal size, each having an awn. In well matured ears a smaller third grain forms. Grains long and medium plump, with very harsh hulls, brown in colour. It is inclined to shed its grain a little. Rather liable to disease.

*Gidgee, P*1737 (N.S.W.).—Received from Mr. Pridham in 1926. This is the name given to the N.S.W. selection called Glen Innes No. 8. It will be noticed that our selected grain P1470 is a decidedly better yielder. There is no difference in type between the two strains. This will in future be called "Gidgee, N.S.W."

Glen Innes No. 8, *P*1470(N.S.W.).—This variety has been under observation and selection for several years in the Test Rows. It is a variety very similar in type to "Guyra," but matures about seven days earlier.

The straw has the same purple colour, and the grain is also dark brown in colour. It has a rather coarse awn which, however, threshes off quite easily.

Being earlier maturing, it may prove to be an improvement on "Guyra," and from the results of the Trial this season it is evidently a heavy yielder, whether grown for hay or grain.

It will in future be called "Gidgee, W.A.," the new strain received under that name being discarded as inferior.

*Belar, P*1740 (*N.S.W.*). This is a new strain of Glen Innes No. 5 Oats, received from Mr. J. T. Pridham in 1926. It proves to be quite distinct from the original strain received a few years earlier, No. 1412. It is rather later than Mulga Oats and does not mature too well on heavy soil.

Its yields, however, were very satisfactory, and it should prove a useful oat for lighter soils.

Fairly tall growth, stands well, and does not shed its grain. Grain pale yellow in colour, probably fairly plump when fully matured.

*Glen Innes No. 6, P*1410 (*N.S.W.*).—A short-strawed, fairly early variety, received under the name of "Belar," P1740. Late maturing, medium length straw, grain white. When harvested the grain proved to be very immature, although from its appearance it should be fairly plump when fully matured.

Glen Innes No 6, *P*1410 (N.S.W.).—A short-strawed, fairly early variety very prolific. It lodged badly after rain when mature, and for that reason it will be discarded.

Grain white, medium plump, and matures well.

*College Algerian, P*1783—This variety was received early in 1927 from Tasmania. It is evidently a late maturing strain of Algerian, being quite similar in type to that variety. It is a very prolific strain, but too late for our conditions. The grain when harvested was very immature, and the resulting yield light.

(*Algerian* x *Skinless*) *M*22.—This is the result of selection from a natural crossbred found in Algerian Oats in the Test Rows at this farm. It is a Skinless or Hull-less type of oat—Avena Nuda—the grain of which threshes clear of the husk. It is slightly earlier maturing than Algerian, with fair size grain. Its hay yield compares very well with other varieties, but a large proportion of the grain is lost when threshing, being small and light without the husks.

It is doubtful if it would be a profitable type to grow except for household use or as a feed oat for private use.

The yields are as hereunder :—

MERREDIN EXPERIMENT FARM.

JUNIOR FIELD TRIALS, 1927—OAT VARIETIES.

HAY YIELDS.

Weight of Sheaves after curing in the Paddock.

Name.	Reg. No.	Average height when cut.	Section C.		Section E.		Section I.		Average.	
			Actual Yield.	Comparative Yield.	Actual Yield.	Comparative Yield.	Actual Yield.	Comparative Yield.	Actual Yield.	Comparative Yield.
		inches.	lbs	%	lbs.	%	lbs	%	lbs.	%
Burt's Early ...	P1494	50	8 50	100	6·75	100	7·25	100	7 50	100
Buddah ...	P1632	55	10·00	111	7·75	101	8·25	86	8·67	101
Palestine ...	P1716	38	8 75	97	6·00	79	6 50	68	7·08	82
Mulga ...	P1185	53	10 00	111	8 00	105	9·00	93	9 00	104
Gidgee	P1737	50	10 75	119	8·75	115	9 75	101	9 75	113
Glen Innes, No. 8	P1470	50	10·75	119	8·25	108	11 25	117	10 08	117
Burt's Early ..	P1494	48	50	100	8 50	100	11 25	100	9 75	100
Burt's Early ..	P1494	48	9 75	100	7·50	100	9 00	100	8·75	100
Belar ...	P1740	44	10 50	106	9·50	107	11·00	124	10·33	111
Glen Innes, No. 5 ...	P1412	38	9·50	96	8·00	90	10·00	113	9·17	99
(Algerian × Skinless)	M22	45	11 00	111	10·00	113	10·50	118	10·50	113
College Algerian	P1783	42	10 25	104	8·75	99	11·25	127	10·08	109
Glen Innes, No 6 ..	P1410	47	9 00	91	10·25	115	9 25	104	9 50	102
Burt's Early ..	P1494	48	10 50	100	10 25	100	8 75	100	9 83	100

GRAIN YIELDS.

Name	Reg No	Average height	Sectional Grain Yields.					Average Yield	Comparative Yield.
			B	D	F.	G	J		
		inches.	ozs	ozs.	ozs.	ozs	ozs	ozs	%
Burt's Early	P 1494	47	31 125	25 000	31·500	30 500	44 500	32 525	100
Buddah	P 1632	50	40 500	40 875	49 875	53 375	49 875	48 900	138
Palestine	P 1716	40	47·875	37·375	44 625	45 875	48 500	44·850	126
Mulga ..	P 1185	50	43 875	41·625	45 500	51 000	59·750	48 350	136
Gidgee (N.S W)	P 1737	48	44·000	31·750	49 125	49·000	56 000	45 975	129
Glen Innes, No 8	P 1470	48	47 875	41 000	53·500	54 250	51 500	49 625	140
Burt's Early	P 1494	47	27 375	29 750	44 625	43·875	47·625	38 650	100
Burt's Early	P 1494	47	31 625	27 000	30·125	38 375	43 125	34 050	100
Belar	P 1740	49	11 250	38·500	46 500	48·750	51·250	45·250	122
Glen Innes, No 5	P 1412	38	39 750	28·750	34·375	40 000	45·750	37·725	102
(Algerian × Skinless)	M 22	45	34 625	29 000	33 250	43 500	45 750	37 225	101
College Algerian	P 1783	42	31 500	24 250	34·000	34·750	38 500	32 600	88
Glen Innes, No 6	P 1410	46	46 750	36·750	49 500	65·000	55·250	50 650	137
Burt's Early ..	P 1494	47	34 625	33 250	36 000	52·750	43 125	39 950	100

MERREDIN EXPERIMENT FARM.

JUNIOR FIELD TRIAL, 1927—OAT VARIETIES.

Varieties arranged in order of Yield of Hay, with Grain Yields given for comparison.

Name of Variety.	Reg. No.	Hay	Grain.
Glen Innes, No. 8	P 1470	117	140
Gidgee (New South Wales)	P 1737	113	129
Algerian × Skinless)—Huskless type of grain	M 22	113	101
Belar (rather late maturing) ..	P 1740	111	122
College Algerian (very late) ..	P 1783	109	88
Mulga	P 1185	104	136
Glen Innes, No 6 (short straw)	P 1410	102	137
Buddah	P 1632	101	138
Burt's Early (Control)	P 1494	100	100
Glen Innes, No 5 (short straw, late maturing) ..	P 1412	99	102
Palestine (very short straw)	P 1716	82	126

HORTICULTURAL NOTES.

GEO. W. WICKENS,
Superintendent of Horticulture.

Seasonal Work for April, May and June.

APRIL.

April is usually the month in which apple growers of Western Australia are busy picking and packing for export, but this year there will be less forwarded to European markets in April than for many years past. At time of writing—1/3/28—only two boats have been booked, one on the 10th and one on the 16th, and combined loadings on these only amount to 6,000 cases. But though the crop has been light, the work connected with harvesting is the only item in the round of orchard duties which is less on that account.

Fertilisers must be applied, and this is the best month for making the general application in all deciduous orchards: 6 cwts. of Superphosphate, 2 to 3 cwts. of Muriate or Sulphate of Potash per acre, with 1½ bushels of peas sown in April and ploughed under in spring will keep all trees in good heart and will enable the apple trees to bring the heavy crop of fruit which may reasonably be expected next season to a marketable size.

Where citrus orchards are being treated use half the super and half the potash mentioned above, and apply the remainder in spring.

If for any reason peas cannot be grown satisfactorily, use 2 to 3 cwts. of Sulphate of Ammonia or Nitrate of Soda; apply same in spring whether the orchard to be fertilised is citrus or deciduous.

In orchards where Citrus Brown Rot was experienced last season citrus trees should be sprayed to a height of four to five feet from the ground, together with the land under, and extending for a foot or more outside the spread of the branches. Use Bordeaux at a strength of 4 lbs. bluestone, 4 lbs. freshly burned lime to 50 gallons of water; or Burgundy at a strength of 4 lbs. bluestone, 6 lbs. washing soda, 50 gallons of water. The trees should not be sprayed all over, or the beneficial fungi which attack lecanium scales will be destroyed, and these pests will increase with great rapidity.

In districts where fruit fly exists every care should be taken to collect all second crop deciduous fruits which, owing to having no commercial value, are often allowed to remain on the trees, become infested and carry on the pest to the orange crop. All fallen fruits should be collected, and those of no value destroyed by boiling.

Those orchardists fortunate enough to have a crop of "Granny Smith" apples this season are strongly advised to use prepared oiled wraps as wrapping paper before placing the fruit in cold storage. Tests made by the Department have proved that wrapping the variety named as advised will practically eliminate all danger of scald.

MAY.

Pruning will now claim the attention of growers of stone fruits, particularly in the early districts near Perth, where most varieties of apricots, plums and peaches will have shed their foliage. Where varieties of peaches liable to shed their buds ("Briggs," "Hales," "Downing," "Alexander," etc.) are grown, it is advisable to delay pruning until the buds have burst in early spring.

Spray deciduous orchards for the control of San José Scale as soon as the leaves have fallen, using commercial lime sulphur at a strength of one gallon in seven gallons of water, or a reliable brand of spraying oil may be substituted for lime sulphur, using one gallon of oil in 19 gallons of water. To keep San José Scale in check it is necessary to spray twice while the trees are dormant: the first to be applied as early as possible after the leaves have fallen, and the second towards the end of winter in late August. As August is often a very wet month, care should be exercised in making the May spraying a very thorough one.

Where orange and lemon trees in affected orchards were not treated for Brown Rot last month they should be sprayed during the early part of this month, using Bordeaux or Burgundy as advised in April notes. In tests made both by this Department and individual growers it has been shown that one spraying in April or early May is sometimes sufficient to control the disease for the remainder of the season, but should the season prove favourable for the fungus, the trees should receive a further spraying when signs of infection appear. Later sprayings have the effect of spotting the fruit, but it is better to remove spray spots from sound fruits at time of picking than to have the crop destroyed by disease.

With the advent of wet weather, baiting operations for fruit fly are largely ineffective, but trapping in orange and lemon groves should be continued throughout the winter months.

JUNE.

Pruning of all deciduous trees should be pushed on with during this month.

Planting may be undertaken wherever the soil is not too wet and sticky.

Young plants, when received from the nursery, should be heeled in carefully so as to prevent the roots from drying out. To do this effectively the bundles of ten, in which the nurserymen usually tie up the trees, should be opened and each tree placed separately in the soil. If this is done as soon as the trees arrive, no harm will result if the planting has to be postponed for some weeks in the months of June or July.

The notes on planting for this month refer to deciduous trees only. Citrus trees give best results if planted at the latter end of August or early in September.

Any San José Scale infested orchards which have not received the first spraying mentioned in notes for May should be treated as early as possible this month.

Citrus growers should examine cracked oranges for signs of fruit fly, and destroy any found to be infested.

The orange export season commences this month, and this opportunity is taken again to stress the importance of handling the fruit most carefully when gathering, packing and loading. Bruised fruit and fruit with skin abrasions caused by finger nails will develop moulds and arrive in an unsaleable condition, a loss directly to the sender to the extent of the affected fruit, and indirectly and probably a much greater loss in bearing down the price of sound fruit offering on the same market.

THE VALUE OF THE CERTIFIED SEED POTATO SCHEME.

W. E. COLLINS,
Potato Inspector.

For the year 1926-27 it was estimated that 5,144 acres of potatoes were planted. The yield from this 5,144 acres (17,753 tons, or 3.45 tons per acre) was determined to a very large extent when the seed was selected. On the quality of the "sets" planted, much of the success of the potato crop depends. It may reasonably be assumed that this percentage (the highest in the Commonwealth) was to some extent due to the method of seed selection, as adopted by the more progressive growers, and to the use of seed under the Certified Seed Scheme.

For the benefit of growers not familiar with the Certified Seed Scheme particulars are given herewith:—

The first step to be taken under the Scheme is for the grower to make application for inspection of that portion of his crop which promises well for seed purposes. The area must be clearly pegged out and proper attention to "rogueing" carried out by the grower during the growing period to ensure seed true to name. After, say, three close inspections during growth the Inspector is present during bagging, and if satisfied of the cleanness and trueness to type of the tubers, the bags are sewn in his presence, and marked and transferred to the grower's shed, where the final inspection and grading into new bags, bearing the name and address of the grower takes place. Should the tubers still conform to the requirements of the Scheme as to grade and freedom from disease, the bags are double sewn and the certificate sealed on to the ends of the twine. No certificate is furnished unless the crop inspected, taking into consideration character of the season, yields well.

Only tubers above 3ozs. in weight are permissible under this Scheme, as large seed (for cutting) only is considerable desirable.
The register of the growers under this Scheme is kept by the Potato Branch, so that all inquiries for first class seed may be referred to the officers of the Branch.

The tag or label to be attached to each bag has set out on the front of it the grower's name and address, the variety and grade of the tuber, the signature of the Inspector, and the date on which the produce was inspected. On the back of this label are set out the conditions of the granting of the certificate.

The charge for the services of the Inspector is 3d. per bag. Where no certification follows no charge, of course, will be made.

Applications to come under this Scheme will not be dealt with until the crop is sufficiently forward to form a reasonable idea of its ultimate yield.

It is only during the past few years that growers have recognised that the value of seed potatoes cannot be determined merely by the inspection of potatoes after they have been harvested and offered for sale. While this method of inspection is better than none, it comes very far from helping the industry to obtain really good seed. What is required is that each grower should select, when digging, his very best roots, and reserve them for a special seed plot in the following season. These should be grown quite separately from his commercial crop, and given his utmost attention, during the period of growth, in the matter of eradicating all weakly and abnormal plants. By adopting this method, a system of continual selection would be carried out, and the progeny from undesirable and diseased seed would be eliminated—so bringing his seed to a very high standard.

These plots should come under the inspection and advice of the officers of the Potato Branch, who are ever ready to advise and assist in this direction, for the betterment of the industry generally. If the grower has doubts about the quality of his present holding of seed, certified seed can be highly recommended for his seed plot. Intending purchasers can be put into touch with growers of this seed on application to the Senior Potato Inspector.

Practically all experiments connected with the selection of seed potatoes from the best plants in a plot have shown that yields can be greatly increased through the use of such selected plants. Reports from numerous growers, in a number of cases, state that certified seed gave double the yield of ordinary seed. The value of this inspection work as carried out by the officers of the Potato Branch is being recognised and appreciated more and more every year as larger quantities of such seed become available, and a greater number of growers take advantage of the information to be gained from having their plots inspected.

Even if a grower does not wish to specialise in the sale of Certified Seed, the benefit to be derived through an inspection of his plots, in order to improve the quality of his own seed and consequent yield of his main crop, is sufficient to make it worth while. It is very important to use good seed if the best results are to be secured. The seed should be from vigorous, productive plants, relatively free from disease, and true to type.

Without certification the grower who buys his seed from other localities, in most cases, has no way of knowing the character of the plants from which his seed was harvested. Neither has the grower any way of knowing the prevalence or otherwise of potato diseases on the seed producer's farm. Proper inspection and certification tends to reduce. not only the number of potatoes not true to type, but also many diseases such as Rhizoctonia, Common Scab, Mosaic, Curly Leaf, etc. Absolute freedom from all disease is well nigh impossible. The well-known diseases Rhizoctonia and Common Scab are found to a greater or less extent in most of our soils, and consequently are to be found affecting most of our potatoes. Since these diseases decrease the yield, the infection of seed stocks should be kept as low as possible.

Rhizoctonia and Common Scab can be almost entirely eliminated by the treatment of seed with a solution of corrosive sublimate, and if the grower is willing to go to the trouble of treating his seed, the presence of these two diseases should not prevent the use of seed so infected, if it is known to be otherwise of high productive qualities. Mosaic, Leaf Roll, and Thready Eye are diseases which cannot be discovered through an inspection of the seed, but which nevertheless are carried with them, and such diseased seed will produce only diseased and unproductive plants. The only way, therefore, to prevent increasing outbreaks of these diseases is thorough inspection, whilst growing, of plots intended for seed purposes, and the rigorous "rogueing" or elimination of all infected plants before harvesting the crop.

Summary.

Growers should have their own seed plots, which should be grown quite apart from his general crop. It is a noteworthy fact that a grower does not like to "rogue" his general patch—but, the same man would not hesitate a moment in the pulling out of undesirables from his seed plot.

The Potato Branch will inspect, and advise in these particular plots.

"Dipping" the seed is of great importance. It minimises fungi and bacterial troubles.

SEEDS.

PEDIGREE DELAWARE SEED POTATOES

grown under the inspection of the Department of Agriculture.
In new sealed bags, certified by the Department's Inspector.

ROUND AND LARGE DELAWARE SEED

inspected and dipped in Fungicide Solution, under the direction of the Department of Agriculture.

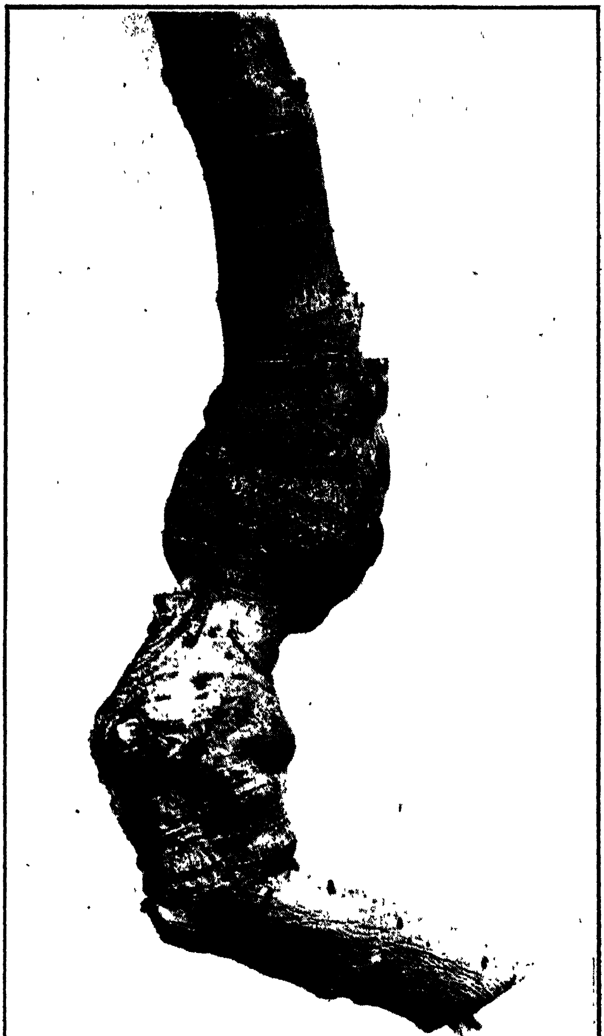
Seed Wheat and Oats, Barley, Rye.

Subterranean Clover, Field Peas, Paspalum, Rape, Lucerne, etc.

Prices and particulars obtainable from the Seed Department

THE WESTRALIAN FARMERS, LIMITED,
WELLINGTON STREET, PERTH.

4—4



1. Stem-tumours on young wood of Dunns apple.

BURR-KNOT AND STEM-TUMOUR OF APPLE AND QUINCE TREES.

W. M. CARNE, F.L.S.,
Botanist and Plant Pathologist.

Quinces and some varieties of apple trees are subject to unsightly wart-like swellings on their branches and stems. These swellings can be roughly divided into two types—

1. *Burr-knot.*—Rough wart-like areas projecting up to about ¾ inch beyond the surface of the stem. The surface of the knots is covered with a compact mass of small rounded projections.
2. *Stem-tumour.*—The wart-like swellings are smooth on the younger growths but eventually become broken and rough on the surface. These tumours carry smaller swellings on their surfaces.

Burr-knots are found on quinces and some apples, particularly Northern Spy. They are formed laterally on the branches though several may fuse together to form a rough enlargement surrounding a branch.

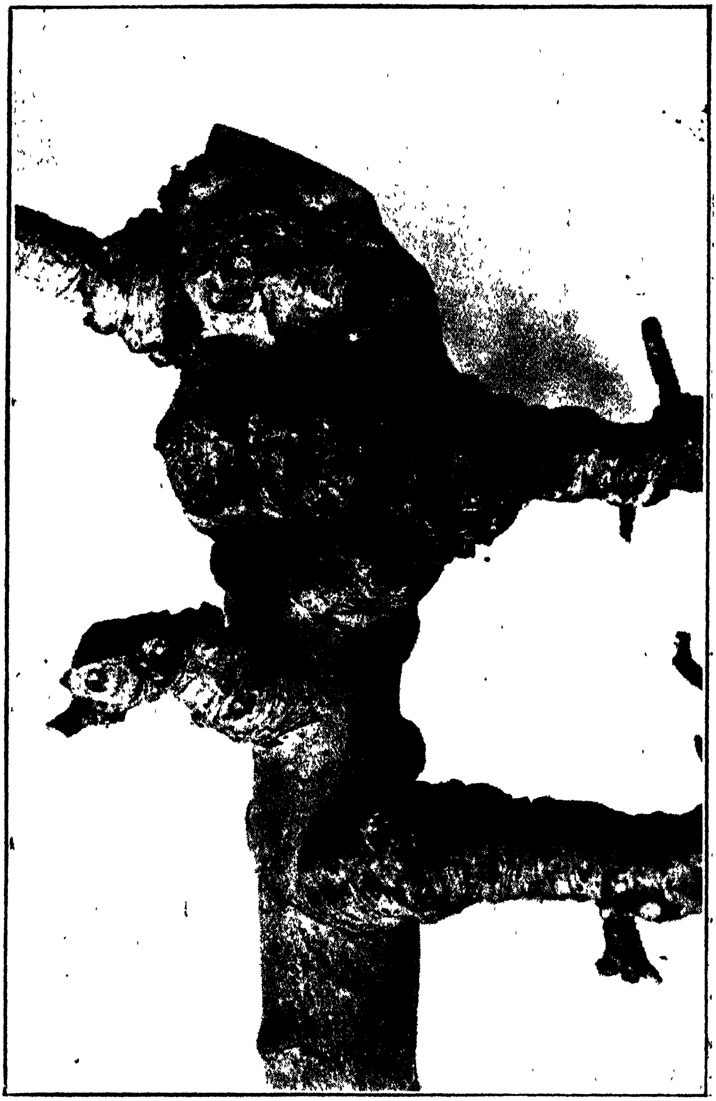
Stem-tumours are usually developed in the same way as burr-knots. In the Dunns apple, however, they frequently originate in general club-like swellings of, rather than on the side of, the branches. They are particularly liable to develop on old spurs, where branches fork, and around dormant buds. In stem-tumours the small rounded projections may be noted on old broken tumours but they are scattered singly or in small aggregations over the tumour instead of occupying the whole surface as in burr-knots.

Examination of both types shows that they have their origin in the development of aerial or adventitious rootlets. These rootlets form the rounded projections on the rough surfaces. They are developed, make a little growth, become dormant and finally die. The annual production of new rootlets causes the knots and tumours to become larger until they form irregular swellings upwards of six inches in diameter.

If cuttings with knots or tumours are planted in moist ground in the spring they root readily.

On Northern Spy stocks it is common to find masses of fibrous roots developed near the ground level. These have their origin in burr-knots. Throwing up soil against the stems in the spring will induce a greater development of these hairy roots.

Though unsightly in appearance there is no evidence that the knots or tumours on the branches or the development of fibrous roots around the bases of Northern Spy stocks in any way affect the growth or cropping of the trees. It is probable that the bad effects sometimes attributed to the fibrous aerial roots on Northern Spy stocks are really due to unsuitable soil conditions for normal rooting which induce a greater development of the aerial roots.



2. Stem-tumours on old wood of Dunns apple.

The formation of burr-knots or stem-tumours is a varietal characteristic. Swingle, in the United States, after examining many varieties of apples, nearly 50 per cent. of which showed some tendency to knot or tumour formation, came to the conclusion that many varieties no longer grown commercially had been abandoned because of this tendency. Besides being unsightly these formations were formerly attributed to a bacterial disease known as Crown Gall, and particularly to that form of it known as Hairy Root. This opinion still has supporters in Australia in regard to the fibrous roots of Northern Spy. However, bacterial Hairy Root of any apple variety has been demonstrated in only very few cases in Australia and is probably rare.

The principal objection to the knots is that they form attractive harbourage for Woolly Aphis and Red Mite.

Summary.

1. The tendency to produce burr-knots or stem-tumours is a varietal characteristic of quinces and some varieties of apples.
2. The knots or tumours are associated with the development of dormant aerial rootlets.

3. Stem-tumour showing tips of dormant roots.

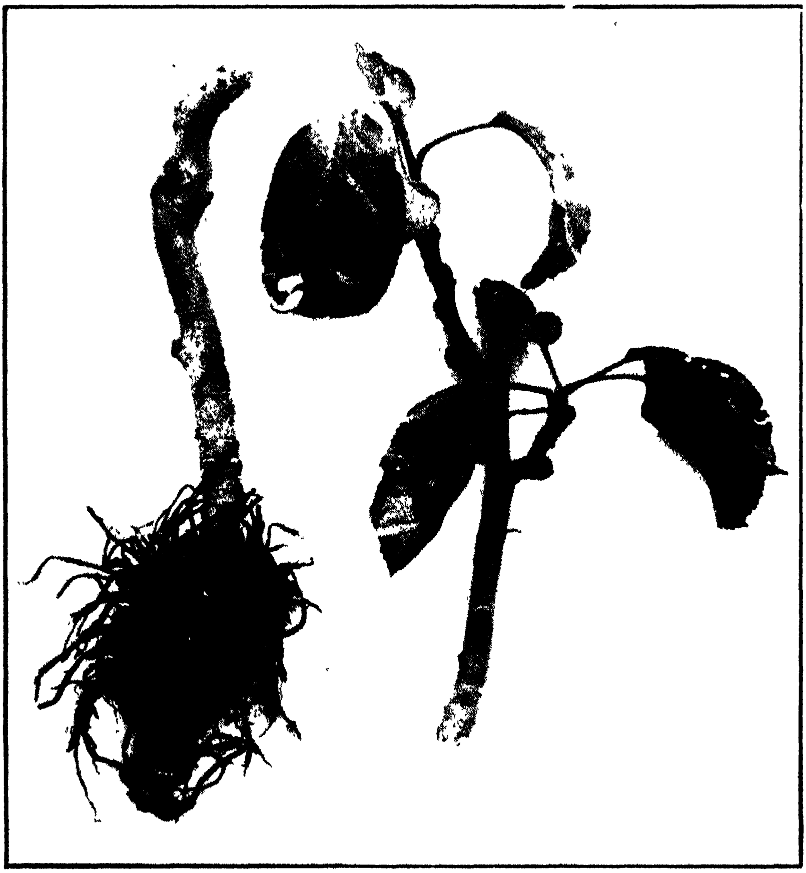
3. There is no evidence that burr-knots or stem-tumours have any detrimental effect on the growth or cropping of apple and quince trees.

References.

Brown, N. A.—An Apple Stem-tumour not Crown Gall. *Journal Agric. Research,* XXVII., 695, 1924.

Swingle, C. F.—Burr-knot of Apple Trees. *Journal Heredity* 16, 313, 1925.

Birmingham, W. A.—Burr-knot or Stem-tumour of Quince and Apple Trees. *Agric. Gaz., N.S.W.*, XXXVIII, 941, 1927.



4. Apple cutting rooting from stem-tumour. Planted in moist soil in August and photographed in December, 1927. Cutting divided for convenience in photographing.

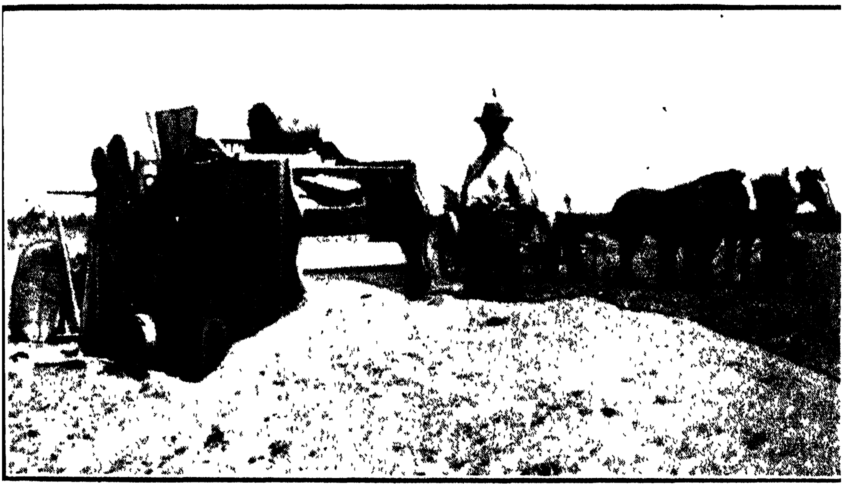
WHEAT TRIALS AT KALGOORLIE.

H. Rudall, Field Officer.

Demonstration wheat trial plots were again carried out last season at Kalgoorlie by the Municipal Council in co-operation with the Department of Agriculture.

The area of each plot was one acre in extent and consisted of the varieties "Noongaar," "S.H.J.," "Gluyas Early" and "Nabawa."

Cultural Notes.—The land was ploughed in July, 1926. Light harrows were used in September, 1926, and February, 1927. Owing to the light falls of rain from ploughing to February very little attention was given to the work until the heavy rains during March, totalling 503 points. Cultivation immediately took place with disc harrows, but owing to the compactness of the soil after such a fall, the harrows were hardly heavy enough to leave the whole of the block in a uniform mellow condition. A heavier implement would have done the work had it been available.



Winnower and Chaff Heap, Kalgoorlie Demonstration Farm, 1927.

Seeding was completed on 3rd May. Rate of seed 40 to 45 lbs.; super 75 to 80 lbs. per acre.

The monthly rainfall during the fallow and growing period is shown hereunder:—

Monthly Rainfall.

From Date of Ploughing to Planting—

August, 11 points; September, 37 points; October, 11 points; November, 32 points; December, 35 points; January, 4 points;

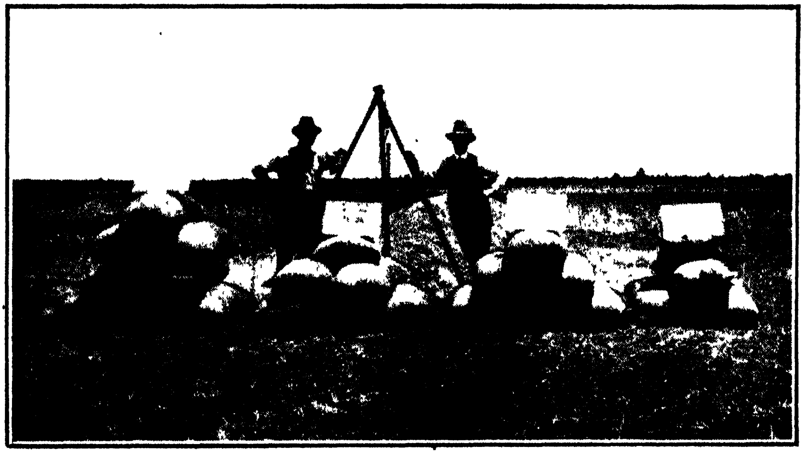
February, 80 points; March, 503 points; April, *nil;* Total, 713 points.

After Planting—

May 9th, 24 points; May 16th, 11 points; total for May, 35 points. June 4th, 9 points; June 15th, 50 points; June 17th, 13 points; June 27th, 49 points; total for June, 121 points. July 2nd, 2 points; July 13th, 6 points; July 25th, 6 points; July 27th, 69 points; July 28th, 2 points; July 30th, 5 points; total for July, 90 points. August 8th, 29 points; August 23rd, 34 points; August 24th, 13 points; total for August, 76 points.

Rainfall during Growing Period.

May, 35 points; June, 121 points; July, 90 points; August, 76 points; Total, 322 points.



Harvested Grain. Kalgoorlie Demonstration Plots, 1927.

The average monthly rainfall recorded for Kalgoorlie is as follows:—

Rainfall Records for Kalgoorlie Zone.

31 Years (1896 to 1926).

January, 36 points; February, 68 points: March, 91 points; April, 88 points. Useful rains (May to October): May, 120 points; June, 116 points; July, 85 points; August, 87 points; September, 48 points; October, 64 points; total, May to October, 520 points. November, 55 points; December, 57 points. Total for year, 915 points.

The rainfall during the growing period to the end of August amounted to only 322 points, when most of the varieties were well headed and "Noongaar" was changing colour.

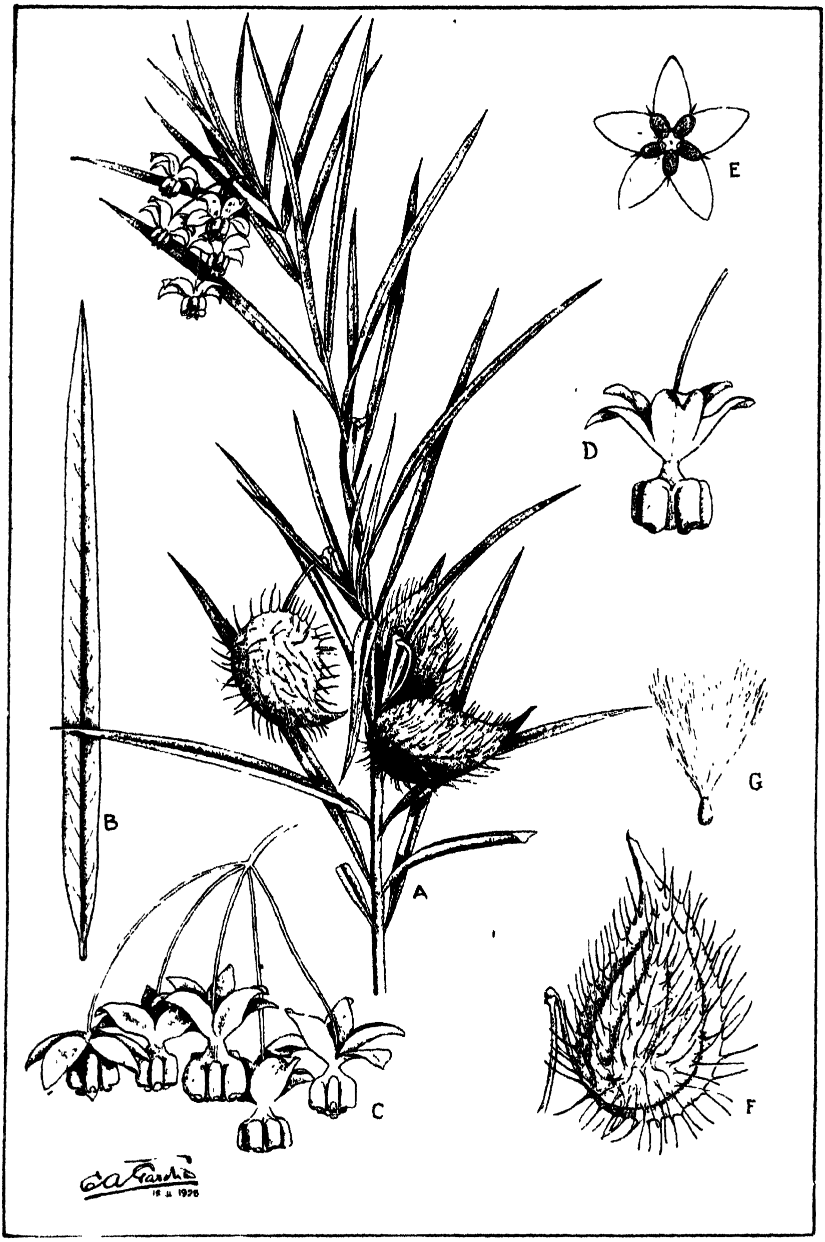
After the early varieties—"Noongaar," "S.H.J." and "Gluyas Early"—were well headed a further 168 points of rain were recorded during the month of September. The conditions which accompanied that rainfall helped to assist the production of the crop.

The acre yields obtained were:—

	bus.	lbs.
Noongaar	25	0
S.H.J.	18	0
Gluyas Early	15	0
Nabawa	9	30

The results of the latter variety, "Nabawa," cannot be used for comparative purposes with the others, owing to a strip of land in this plot consisting of much heavier clay soil than the remainder, and the disc harrows were not heavy enough to make the land as mellow as that portion from which the bulk of the yield from this variety was obtained.

The yields of the other varieties, and particularly "Noongaar," are excellent for the rainfall during the growing period, though it must not be forgotten that in March 503 points of rain were recorded, and this being stored in the fallowed land would be of benefit to the crops which were planted in April. This first yield of "Noongaar" shows it to be a variety of considerable promise as a drought resister.



Cotton Bush.
(*Asclepias fruticosa*, Linn.)

Explanation of Plate.

A.—Branchlet with flowers and fruits. B.—Leaf (nat. size). C.—Umbel of flowers (nat. size). D.—Flower. E.—Diagram of flower. F.—Fruit. G.—Seed.

COTTON BUSH.

(*Asclepias fruticosa,* Linn.)

W. M. CARNE, F.L.S., and C. A. GARDNER.

Cotton Bush is often known under the name of *Gomphocarpus fruticosus.* It is a shrub attaining a height of 4 to 8 feet, erect and slender in growth, and has a milky sap which exudes from cut or wounded parts.

Commonly grown as an ornamental shrub in gardens and parks, the plant has become naturalised in the Armadale district and in various parts of the South-West, principally along roadsides. Its habits of free seeding and rapid growth have made it an undesirable plant, particularly in orchard areas, but the plant is not to be regarded as a very serious weed. It was formerly a proclaimed noxious weed because it harboured the black scale (*Lecanium oleae*) a pest no longer serious in Western Australia, being controlled by parasitic insects.

The plant is native to South Africa, and was introduced into Western Australia at an early date. It may be easily recognised by its peculiar fruits which bear a fanciful resemblance to a duck or swan, and are filled with a silky white substance resembling kapok, but having no staple is useless commercially. Cotton Bush is known to some horticulturalists as "Swan Bush," and is often erroneously regarded as being native to North-Western Australia.

Description of Plant.—A shrub of 4 to 8 feet, erect and slender, the leaves narrow-lanceolate, bright green and shining above, acute, flowers white, in loose dropping umbels consisting of 3 to 10 flowers. Calyx-lobes small and narrow, corolla-lobes minutely fringed. Within the corolla is the corona, which consists of five pouch-like organs with their outer edges lower than the inner, the inner terminating in two incurved claw-like teeth. Fruits ovoid-acuminate, pale green, almost membranous, inflated, covered with soft prickles. Seeds with terminal tufts of silky hairs which open when the ripe seeds are liberated from the fruit, enabling the seeds to be wind-distributed. The number of floral parts varies from 4 to 5 in occasional plants. For further particulars see plate.

SHOT-HOLE BORER.

(*Xylion gibbicollis*)

Family: *Bostrychidae.*

L. J. NEWMAN, F.E.S.
Entomologist.

During the past two seasons, some anxiety has been experienced by vignerons owing to the discovery of the presence of a small boring beetle affecting the vine canes.

To determine the extent of the invasion and the damage caused, or likely to be caused, an investigation by the writer in conjunction with Mr. Johns, Viticulturist, has been made. Districts as far south as Katanning, and eastward to Northam and Toodyay, and the coastal plains vine country were visited. The beetle was found to be present in all areas inspected.

During the taking of our observations, we examined many native timbers surrounding the vineyards. It was proved that the same beetle was present.

The following timbers were collected and placed under incubation, and yielded the borer:—

York Gum, *Eucalyptus foecunda*, var. loxophleba.
Manna Wattle, *Acacia microbotrya.*
Jam, *Acacia acuminata.*
Hakea glabella.

There is little doubt that other timbers are also affected. It is demonstrated that the beetle is widespread.

The *Bostrychidae,* to which this group of beetles belongs, are readily recognised by their curious cowled or hooded thorax, which is protruded over the head, the head being turned down beneath. The body is long compared to its width and cylindrical, being adapted for burrowing. The antennæ or feelers have the last three joints enlarged, forming a typical clavate or clubbed appendage. The larvae are short, thickset, fleshy, legless creatures, and live, feed and pupate within the tunnels which they make in the wood.

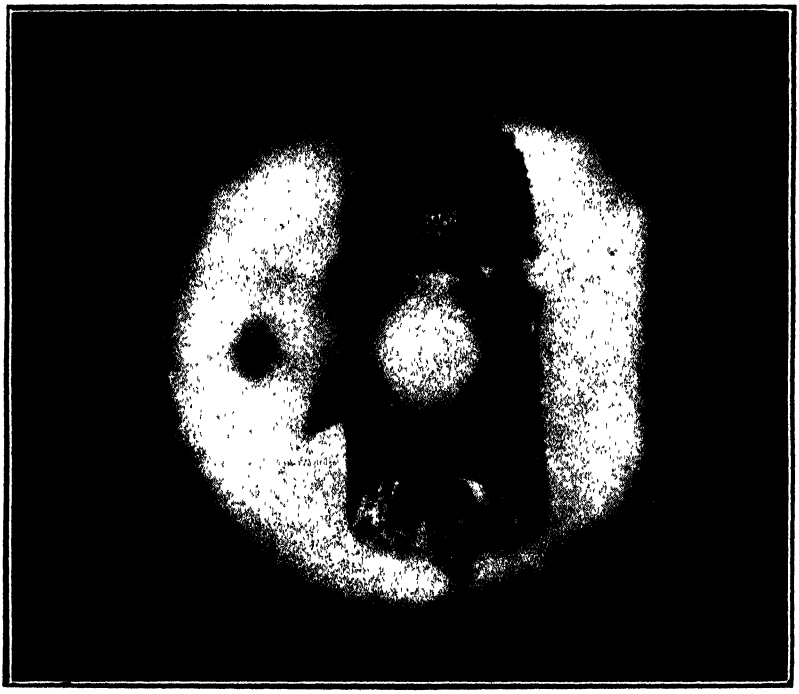
Xylion gibbicollis. Life history.

The Egg.—This is deposited in a small shot-hole made in the wood by the parent.

The Larvae.—This issues from the egg, is legless, thickset and fleshy. It feeds by tunnelling and finally pupates within its own gallery.

Pupa.—Naked, turning brown before the adult issues.

Imago or Adult.—A small cylindrical insect, varying in length from 1/8in. to 1/4in. The thorax is produced into a cowl or hood over the head. It is shiny black, deeply punctate and ornamented with a number of blunt rounded, teeth-like projections. The eyes are somewhat prominent, the antennæ clubbed. The Elytra or wing covers enclose the whole of the abdominal portion of the body. They are hard and sharply truncated, giving the insect an abrupt sawn-off appearance. The colour of the Elytra is rusty red at the apex, gradually shading to black at the posterior or hind end. Like the thorax, they are deeply pitted with numerous small irregular depressions, giving the insect a generally rough appearance. The legs are reddish yellow.



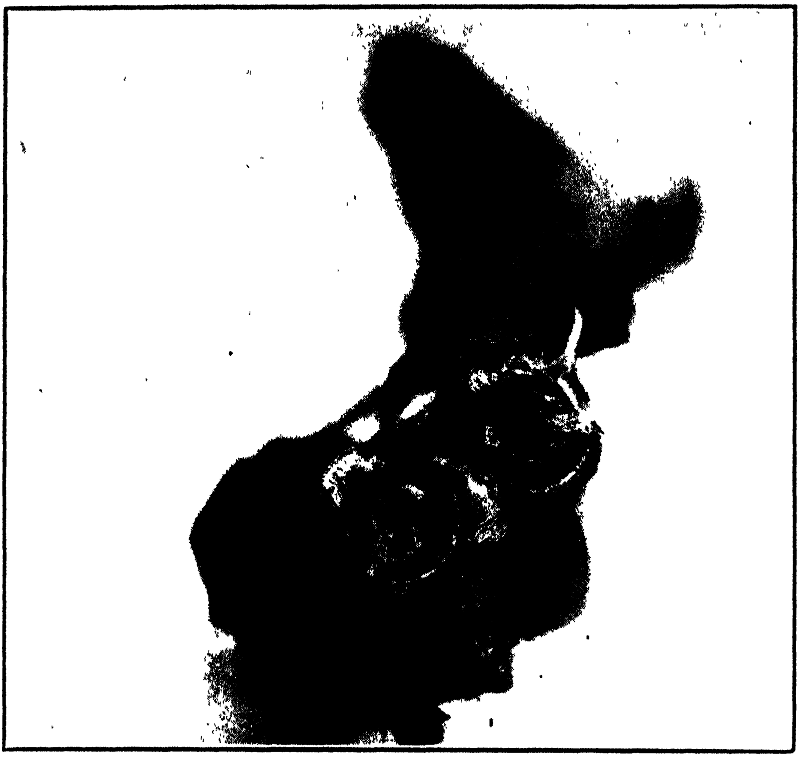
1. Adult Beetle, viewed from above.

There appears to be two complete generations per annum in the vines.

Method of Attack.

The beetles and their larvae bore into the wood. The tunnels may be straight, or they may be in the form of a girdle.

From careful observation, it was noted that the girdling of the Cambium tissue was only done when there appeared to be an excess of sap. The girdling indicates that this borer prefers dead, dying or debilitated wood to work in, hence the cutting off of the sap by means of the girdle. In no instance was the girdle found to be complete, there always being a small section of the Cambium left intact. *See* Illustration.



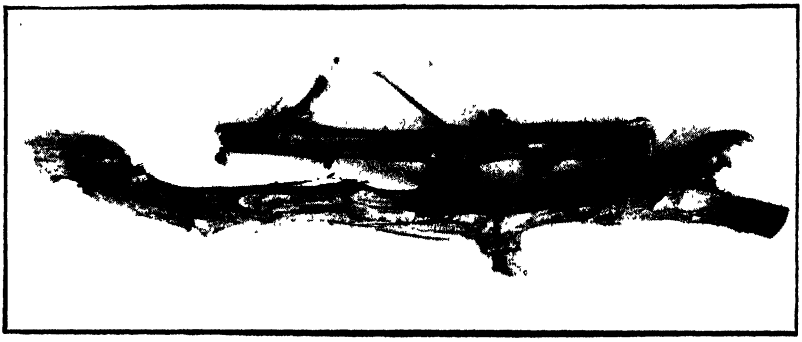
II. Section of Vine Cane showing typical girdle

In examination of the infested vineyards, it was clearly demonstrated that vines which had become more or less weakened through lack of manure, or stressing for want of moisture, or over cinctured, were the ones to be infested. In a vine showing any vigour, the damage was found to be only temporary, the wound being gradually calloused over and completely healed.

One of the disadvantages following the girdling is the tendency of the canes to snap off when being tied down into position after pruning. Another result seen was the poorness of quality of the fruit.

An indication of attack is the exudation of gum.

Control.—The problem of control, even if a satisfactory form of insecticidal treatment could be evolved, is complicated by the fact that the borer possesses a large number of native host plants. This means that should it assume the status of a major vine pest, it will be a constantly recurring one, as it would re-establish itself in the vineyards from the adjacent infested bush lands. I do not, however, anticipate that this borer is going to be a serious vine pest, provided the vines are kept in a healthy vigorous condition.



III. Vine Canes showing typical gumming when attacked by Shot-hole Borer.

The suggestion that an improved condition of growth should endow a plant with enhanced recuperative powers and, even in some cases, with a greater degree of resistance to attacks by pests is, I think, a reasonable one. This was borne out in all cases where the attack was made on a vine of any vigour. In every such instance, the wound healed over and the vine appeared none the worse. When, however, the vine attacked was weak, then the damage was serious.

The healing of the Shot-hole borer galleries is a natural phenomenon, which occurs in all vigorous growing plants The healing is brought about by the formation of plant tissue, which entirely covers the gallery entrance and allows of the formation of normal wood outside. It is obvious, therefore, that in any measure of control against this borer, the healing process must be our main line of action.

The formation of new tissue over the wound can only be brought about by an adequate supply of plant food and moisture. The fact that vines which are stressing through drought are more readily attacked, indicates that the plant has lost its powers of healing and resistance and is, therefore, a suitable subject for the beetle.

Prevention and Treatment.

To meet the situation created by the presence of this borer in our vineyards, I submit that the matter of its control is only possible by keeping the vines in a good healthy growing condition. To accomplish this, they must be manured, well cultivated, and the moisture contents of the soil maintained.

Shallow land, which dries out in summer, should not be planted, because although the necessary manure may be applied, it will not be available to the plants owing to the lack of soil moisture.

Nitrogenous fertilisers promote good growth and would thus stimulate a healing process, and also render the wood of the vine unsuitable for the propagation of the pest.

If water can be applied to vines which have become droughted, much checking of the borer would take place.

As a protective measure against an early summer attack of the borer, I would advise the thorough spraying of the vines after pruning with the combined lime-sulphur and arsenate of lead mixture. To every 50 gallons of lime-sulphur mixture, add 2½lbs. of arsenate of lead. This will act as a protective coating against borers and also prove a useful fungicide. Apply this spray just before vines begin to break.

Note.—The arsenate of lead should be added to the lime-sulphur immediately before being applied. If allowed to stand together for any length of time, a chemical reaction takes place.

In pursuing the investigation, it was found that the borer was breeding very freely in the old vine prunings. It is very important, therefore, in any effort of control, to see that all vine or fruit tree prunings are destroyed by fire as soon as possible. By leaving such cuttings, countless numbers of beetles will be bred, which will have a natural affinity to vines or fruit trees.

In conclusion, I desire to state that I have no fear of this insect becoming a serious vine pest, provided vineyard sanitation, manuring, and cultivation are practised, thus keeping the vines in a vigorous resistant condition. Under conditions of neglect, it may prove a very serious factor.

ERRATUM.

In an article from the pen of the Director of Agriculture, entitled "Pertinent Topics," and appearing in the December issue of the Journal last year, part of the second line in the penultimate paragraph of the topic subtitled "Yandilla King and Rust," page 505, is made to read—" and to infection from the seed or soil." Obviously, this should be read "and *not* to infection from the seed or soil."—(Editor.)

PIG-RAISING IN WESTERN AUSTRALIA.

P. G. HAMPSHIRE,
Superintendent of Dairying.

Pig-raising in Western Australia may safely be said to be comparatively satisfactory in comparision with the ratio of pigs to dairy cows, as obtains on perusing statistics regarding the number of pigs and cows in the Commonwealth. In Western Australia, however, despite the fact that there is a greater ratio of pigs to cows, all that is possible is being done in regard to the development of this very important industry.

Dairy production in Western Australia has increased 150 per cent. during the last 10 years.

The State is provided with well equipped bacon factories, which are large enough and equipped with modern apparatus and well capable of treating far more pigs than are being received.

A considerable improvement is necessary here, as is probable elsewhere, in regard to a better type of average pig forwarded to the factories for manufacture into high class bacon. There is no doubt that one of the principal disabilites with which the bacon manufacturer has to contend is the curing of unsuitable pigs and making them into bacon. The question of suitable pigs is in the hands of the pig-raiser to a very great extent, assisted by proper facilities for transport to market quickly and efficiently.

Western Australia is well provided with pedigreed studs of pigs, where high class stock are bred and available for distribution throughout the State. The Government has studs of pigs at the Muresk Agricultural College Narrogin School of Agriculture, Denmark Stud Farm, Hospital for Insane, Claremont, Wooroloo Sanatorium, and is doing all in its power to provide—and advise the farmer in regard to the use of—pure high class boars for breeding good quality profitable market pigs.

The Department of Agriculture has urged upon every occasion the use only of pure bred, good type boars. The development of group settlements has greatly increased the pig production of the State.

The most popular breeds of pigs in Western Australia are :—Berkshire, Yorkshire, Tamworth. The other breeds of pigs, such as Large Black, Poland-China, Gloucester Old Spot, and Duroc-Jersey, are comparatively few in number

The Berkshire stands out as being the most popular, and the Berkshire boar is the one generally used.

The Gloucester Old Spot breed was introduced into the State only a few years ago.

The class of pig that is being bred for marketing by the keenest and most practical pig-breeders is known as the Berkshire-Tamworth: Comeback. This pig is one of the most popular at the factories, and commands highest price.

In the southern (cooler) portion of the State the Berkshire-Yorkshire cross is also favoured.

In the feeding of pigs in Western Australia, separated milk, pollard, wheat, and pasture are the principal foodstuffs used.

Indicative of the development of the dairying industry in this State might be quoted the increased area laid down to permanent pasture during the last six years.—In 1921 the area of pasture was 17,000 acres, whereas in 1927 the estimated area was 125,000 acres.

The slogan adopted in the development of the pig-raising industry in this State is 1 brood sow to every 3 dairy cows.

Previous articles in the Journal have dealt with the "Breeding of Pigs for Market" and the "Selection and Management of the Herd Boar and Brood Sows." The subject of "Feeding Pigs" is of great importance to both feeders and breeders alike, and success or failure of the industry depends largely upon the methods employed.

Feeding Pigs.

The principal factors to remember in selecting feed in successful pig-feeding are :—

1. A pig has a comparatively small stomach. Its food must be rich and condensed or concentrated.

2. Foods such as milk, buttermilk, pollard, meat meal, peas, beans, lucerne, rape, clovers, cotton seed, linseed, and blood meal are proportionately rich in protein. The proteins are flesh formers, builders of bone, muscle, nerves, hair, hide, and hoof.

3. Foods such as maize, sorghum, barley, wheat, rye, and oats are proportionately rich in carbohydrates. The carbohydrates are the fat formers or energy producers.

4. Foods such as mixed pasture, green fodder crops, potatoes, artichokes beet, mangels, apples, and vegetables supply increased appetites, variety, succulence, and palatability.

5. A complete ration is somewhat complex. Chemical analysis of foodstuffs guide us in the preparation of rations. Foods vary considerably, especially pastures. No one food is sufficient in itself, though some are nearly so The majority are deficient in some essential part to obtain best results. When feed contains unbalanced proportions of either protein or carbohydrates, animals are required to consume undue quantities of one principal constituent to obtain sufficient of the lacking foodstuff in the ration. This is waste of food, apart from the unnecessary work required to digest the surplus carbohydrate or protein.

To balance a ration is to mix foods in their right proportion, giving the right amount to obtain the maximum of result for the least expenditure. Balanced rations mean economical and high production meat and milk (or food conservation). Unbalanced rations mean expensive and low production (or food wastage). As an instance, herds of cows have been fed balanced rations with a certain milk production. The herds have been equally divided, everything being taken into consideration in obtaining equal division; one half contained on the balanced ration, the other half of the herd given the same amount of food units but unbalanced, with marked reduction in milk (over 1 gallon per day per cow). When put back on the balanced ration the maximum production was resumed.

With pigs, take the experiment conducted at the Iowa Experiment Station by Professors Jno. W. Evvard : three lots of pigs aged 10 weeks, averaging practically 42lbs. each, were fed for 150 days as follows :—

Lot 1 received maize (as much as they liked), rock salt.

Lot 2 received maize (as 1), salt, plus bone material.

Lot 3 received maize (as 1 and 2), salt, plus meat meal (60 per cent. protein).

Lot 1, at 8 months, weighed 57½lb.

Lot 2, at 8 months, weighed 65lbs.

Lot 3, at 8 months, weighed 226lbs.

Lot 1 required 1,446 lbs. of corn to produce at the rate of 100lbs. of pork.

Lot 2 required 1,297lbs. of corn, plus 10 bone meal, 1lb. salt. to produce feed to produce at the rate of 100lbs. of pork.

Lot 3 required 366lbs. of corn 47lbs, of meat meal and salt or 413lbs. of feed to produce at the rate of 100lbs .of pork.

Lot 1 consumed daily 1.56lbs. corn.

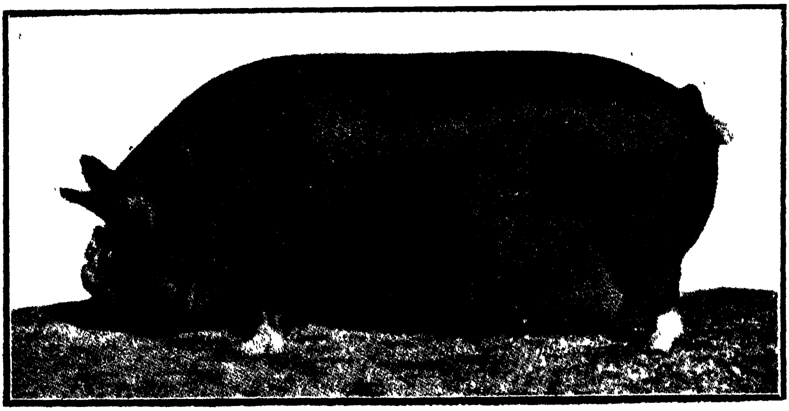
Lot 2 consumed daily 2.00lbs. of corn.

Lot 3 consumed daily 4.40lbs, of corn, or with protein 4.98lbs.

Lot 1 gained .1lb. per day.

Lot 2 gained .15lbs. per day.

Lot 3 gained 1.21 lbs. per day (grew 12 times faster than Lot 1).



A record Fat Pig, sold for £22 15s., on account H. A. College, N.S.W.

Think of the difference between a pen of 10 pigs weighing 573lbs. against 2.260 lbs. at 8 months (1 ton against ¼ ton), and poor quality meat against good quality meat, low price against high price per lb. 1,446lbs. of concentrated food against 413lbs. for 100lbs. gain. The *balanced* economical saving ration against the *unbalanced* expensive and wasteful ration.

A complete balanced ration must contain the proteins and carbohydrates (the main constituents of food) in sufficient quantity and right proportions one with the other, and certain minerals, vitamines, and water. A ration to be a success must be suitable for the animal and be palatable, and to be palatable variety of foods is a big factor. Briefly, a complete balanced ration is a composition of various foods in the right nutritive ratio (protein and carbohydrates) presented in their most attractive form.

The average composition of various foods likely to be used in Western Australia are herewith given to help in apportioning the amount of the food available to balance a ration :—

AVERAGE COMPOSITION OF PIG FEEDS.

Basal Feed per 100lbs.

Name.	Water.	*Protein.* (Flesh, Muscle, Hide, Hoof, Nerve and Bone builders.)	*Carbohydrates* (*or Starch equivalent*). Fattening Foods.	*Nutrition ratio.* (Rate of Protein to Carbohydrates)
Maize (grain)	14	10	79	1 to 7·9
Barley (grain)	12	12	76	1 „ 6·4
Wheat (grain)	11	12	77	1 „ 6·3
Rye (grain)	12	11	77	1 „ 7·0
Sorghum	13	9	81	1 „ 9·0
Peanuts	8	26	120	1 „ 4·6
Supplementary Feeds.				
Meat meal	70	40	39	1 to 1
Skim milk	90	4	5	1 „ 1·3
Butter milk	90	4	5	1 „ 1·3
Blood meal	9	85	3	1 „ ·04
Soya bean meal	12	33	71	1 „ 2·2
Field peas	10	25	63	1 „ 2·5
Oats (grain)	12	12	78	1 „ 6·5
Pollard (wheaten) ...	11	17	72	1 „ 4·2
Bran (wheaten)	10	16	73	1 „ 4·6
Cotton seed meal ...	8	42	51	1 „ 1·2
Linseed oil meal ...	10	33	60	1 „ 1·8
Lucerne hay, high grade	12	20	62	1 „ 3 2
Lucerne leaves	10	24	57	1 „ 2·4
Clover hay, high grade	12	16	70	1 „ 4·4
Potatoes	79	2	18	1 „ 9
Artichokes	80	2	16	1 „ 8
Sugar beet	83	2	14	1 „ 7
Mangels	91	1	7	1 „ 7
Sweet potatoes	70	2	28	1 „ 14
Apples	82	1	19	1 „ 19

The relative ratio of an average balanced ration for a pig is 1 part protein to 4.5 parts carbohydrates. Maize 1 to 7.9 is what is called a wide ration. Peas 1 to 2.5 is a narrow ration.

Sows with litters and young pregnant sows require narrow rations, as do young growing pigs.

BALANCED RATIONS TABLE.

			Protein.		Carbohydrates.
Sows with litters require feed balanced			1	to	3·5
Pigs	40 to 100 lbs.	Growing and fattening	1	,,	3·5 to 4·0
	100 ,, 150 ,,		1	,,	4·5
	150 ,, 200 ,,	Fattening	1	,,	5·0
Up to	200 ,, 300 ,,		1	,,	6·5
Boars	300 ,, 500 ,,		1	,,	5·5 to 6·5
Sows (pregnant)	200 to 350 lbs.		1	,,	5·5
Sows (yelts)	150 ,, 300 ,,		1	,,	5

Let us see how to balance a ration to feed six pigs weighing from 75 to 100 lbs. each.

We want a ratio of 1 of protein to 4 of carbohydrates for such pigs. Foods available, say are wheat, pollard, and skim milk. We look up their compositions.

		Protein. lbs.	Carbohydrates. lbs.
100 lbs.	Wheat equals	12	77 5
50 ,,	Pollard ,,	8·5	36
300 ,,	Skim Milk ,,	12	15
	Total	32·5	128 5

32·5 ÷ 128·5 = 1 to 3·95 nutritive ratio.

1 part protein to 3.95 parts carbohydrates. Therefore, six pigs would require approximately 12lbs. wheat, 6lbs. pollard, and 3½ gallons of skim milk daily.

The addition of grazing mixed pasture or lucerne completes a well balanced ration.

FEEDING EXPERIMENTS.

The writer has given the results of pig-feeding experiments carried out, taking into consideration feeds that may be available in Western Australia.

SKIM MILK *versus* NO SKIM MILK.

Feeding period 100 *days.*

(Conducted by Prof. John W. Evvard.)

	lbs.	lbs.
Initial weight per pig	42	42
Final weight per pig	155	160
Average daily gain	1·13	1·8
Average daily feed eaten—		
Maize	3·4	3·54
Pollard	·61	·44
Meat meal	·62	·43
Skim milk	None	1·84
Feed required per 100 lbs. gain—		
Maize	299·9	299·70
Pollard	53·5	37·0
Meat meal	54·6	36·0
Skim milk	None	155·80

Briefly stated, 155.8lbs. of skim milk required for 100lbs. gain saved 18.6 lbs. meat meal, plus 16.5lbs. pollard, or 10 gallons of skim milk saved 11.9lbs. meat meal and 10.6lbs. pollard, or at market values the skim milk was worth 5d. per gallon.

BUTTER MILK *versus* NO BUTTER MILK.

——	Group 1.	Group. 2
	lbs.	lbs.
Initial weight per pig	150	150
Final weight per pig	296	299
Number of days fed	218 days	156 days
Average daily feed eaten—		
Maize	4·87	2·27
Meat meal	·37	·14
Pollard	·34	·22
Butter milk-	None	32·16
Feed required for 100lbs. gain—		
Maize	441	148
Meat meal	33	9
Pollard	31	14
Butter milk	None	209·1

The pigs fed with butter milk made the most rapid gain, and 100lbs. of it saved 14.09lbs. maize, 1.17lbs. meat meal, and 81lbs. of pollard.

LOW GRADE WHEAT *VERSUS* MAIZE FOR FEEDING PIGS.

(CONDUCTED BY KANSAS AGRICULTURAL COLLEGE.)

Feeding Period— 120 days.

Number of Lot	1	2	3	4	5
Number of Pigs in Lot ...	10	10	10	10	10
	lbs.	lbs.	lbs.	lbs.	lbs.
Average initial weight per pig ...	60·4	60·57	60	59·63	59·13
Feed required for 100 lbs. gain—					
Soaked whole wheat	390	...	...	...	...
Ground wheat	...	402	466	245·7	...
Ground rye	...	...	...	245·7	...
Ground corn	...	...	...	...	485
Meat meal	17·85	19·3	...	...	22
Total	407·85	421·3	466	491·4	507
Relative efficiency of rations in per cent. on basis of least feed for 100lbs. gain	100	96·6	87·4	82·9	80·3

No. 1 Lot was fed the most efficiently. Wheat proved superior to maize whether fed with or without meat meal. It was economy to feed proteins, such as meat meal or skim milk: 19.3lbs. of meat meal saved 63.6lbs. of wheat.

BARLEY *VERSUS* MAIZE FOR GROWING PIGS ON LUCERNE PASTURE.

(CONDUCTED BY KANSAS AGRICULTURAL COLLEGE.)

Feeding period—120 days.

Number of Lot	1	2	3	4
Number of Pigs in Lot ...	9	10	10	10
	lbs.	lbs.	lbs.	lbs.
Average initial weight per pig ...	37·51	37·47	36·35	37·57
Feed required for 100 lbs. gain—				
Soaked ground maize	506 78	...	...	...
Dry ground maize	...	352·15	...	...
Soaked ground barley	...	...	413·87	...
Soaked whole barley	...	...	...	433·01
Meat meal	28·78	26·17	31·69	32·74
Total	335·56	378·32	445·56	465·75
Relative efficiency of rations in per cent. on basis of least feed for 100lbs. gain ...	100	88·69	75·31	72·01

Barley did not prove too satisfactory compared with maize in this test. The age of pigs is the principal factor. Barley contains too large an amount of hull for young pigs.

GRAIN SORGHUMS *VERSUS* MAIZE FOR GROWING AND FATTENING PIGS.

Pigs 5½ months old at beginning of Test, fed 60 days.

Lot Number	1	2	3	4
Number of Pigs in lot	5	5	5	5
	lbs.	lbs.	lbs.	lbs.
Average initial weight per pig ...	99·6	97·87	99·6	99 2
Feed required for 100lbs. gain—				
Ground maize	454·18	..	...	...
Ground feterita ... } Sorghum	...	500	...	...
Ground milo ... } Sorghum	...	...	507 22	...
Ground kafir ... } Sorghum	...	...	...	585·54
Meat meal	18·82	26·64	24·77	26·66
Total	473	526·64	531·99	585·20
Relative efficiency of rations in per cent. on basis of least feed for 100lbs. gain ...	100	89·81	88·91	80·82

THE VALUE OF DIFFERENT PROTEIN SUPPLEMENTS TO MAIZE AS SHOWN BY A 90-DAY EXPERIMENT.

Lot No. ...	1	2	3	4	5	6
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Initial weight per pig...	53·5	56·06	55·34	56·4	50·3	56·4
Final weight per pig ...	126·6	152·26	184·34	121·74	139·85	174·66
Daily gain per pig ...	·81	1·07	1·43	·73	9·9	1·31
Feed required to make 100lbs. gain—						
Maize	364·67	297·87	243·00	407·1	269·76	224·21
Protein supplements :						
Meat meal ...	47·20	25·36	19·38	...	...	...
Pollard	...	90·07	94·77	...	82·4	79·95
Semi-solid buttermilk ...	...	...	53·02	...	...	59·19
Linseed meal ...	...	...	...	65·58	52·03	25·83
Total feed required to make 100lbs. gain	411·87	413·30	410·23	472·68	404·19	389·18
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Cost per 100lbs. gain ...	2 12 7½	2 8 4½	2 9 1	2 15 6½	2 7 6½	2 6 6½
Final value per pig ...	4 14 11	5 14 2	6 18 3	4 11 3½	5 4 10½	6 11 0
Feed cost per pig ...	1 18 6	2 6 7	3 3 10	1 16 7	2 2 3½	2 15 4
Initial cost per pig ...	2 0 0	2 2 0	2 1 0	2 2 0	1 18 0	2 2 0
Margin over initial cost plus cost of feed ...	0 16 5	1 5 7	1 13 5	0 12 8½	1 4 7	1 13 8

Valuation of feeds: maize, 6s. 5d. per bushel; meat meal, £1 2s. 11d. per 100lbs.; linseed meal, 13s. 6½d. per 100lbs.; semi-solid buttermilk, 16s. 8d. per 100lbs. ; pollard, 9s. 4½d. per 100lbs.

AVERAGE DAILY CONSUMPTION OF GRAIN BY VARIOUS WEIGHT PIGS AND AVERAGE DAILY GAIN TO BE EXPECTED.

Weight of Pigs.	Grain Food Daily.	Average Daily Gain.
lbs.	lbs.	lbs.
15 to 50	2·3	·76
50 „ 100	3·35	·83
100 „ 150	4·79	1·10
150 „ 200	5·91	1·24
200 „ 250	6·75	1·33

FORAGE CROPS FOR PIGS.

Fodder crops play an important part in feeding pigs if properly supplemented, and their value may be summarised as follows :—

1. Saving of grain and high-priced concentrates.
2. Saving of labour.
3. Increased vigour of pigs, exercise, and digestion.
4. Decreased possibility of disease (parasitic, etc.).
5. Result in more even distribution of manure and destruction of noxious weeds.
6. Permit use of waste land.

A saving of from 10 to 15 per cent. in the total amount of grain feed may be expected through the use of forage crops.

Pasture and fodder crops are of great value to young growing breeding pigs, breeding sows, etc. Green fodders should represent about 10 per cent. of the ration.

Grazing Lucerne.

THE SELF-FED "FREE CHOICE" PIGS ON LUCERNE PASTURE.

Iowa Experiment Station—Growing and Fattening 2½ months old Pigs.

Initial weight 55 pounds; final weight 225 pounds. Feeding period began 6th July. All groups hand-fed twice daily.

Lot No.	Ration Fed.	No. of Pigs.	Days required to reach 225 pounds live weight.	Feed per 100 pounds gain.			Pasture.
				Maize.	Meat meal.	Total.	
				lbs.	lbs.	lbs.	acres.
1	Lucerne—Maize self-fed plus meat meals self-fed; July 6, p.m., to Nov. 4, a.m.	5	121	342·7	31·7	374·4	·018
2	Dry Lot—Maize self-fed plus meat meal self-fed; July 6, p.m., to Nov. 13, a.m. ...	5	130	354·2	50·6	404·8	None

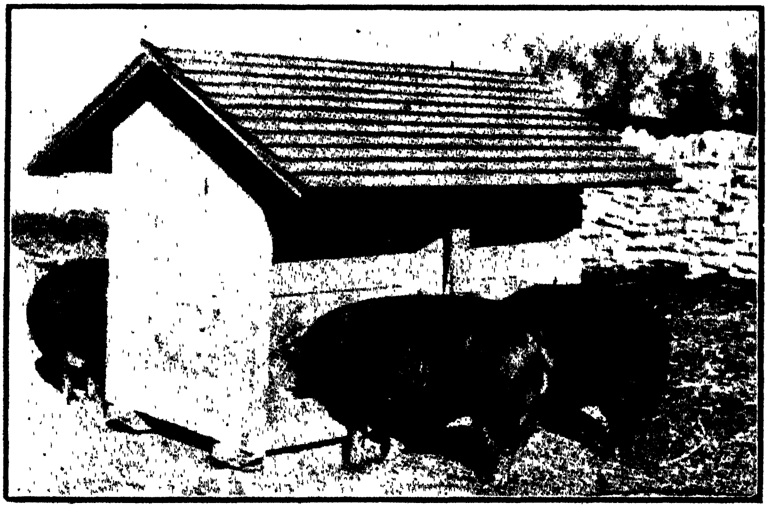
Forage crops for pigs rank in the following order: lucerne, rape, clovers, mixed permanent pastures, barley, rye, soya beans, cow peas, wheat oats.

Lucerne stands pre-eminent as a forage crop for pigs. A good stand of lucerne will carry from 10 to 15 fattening pigs per acre. Rape is easily second—one acre will carry from 5 to 8 fattening pigs. Clovers do exceptionally well in Western Australia and form a most excellent pasturage for pigs.

Feeding off Rape.

SELF FEEDERS.

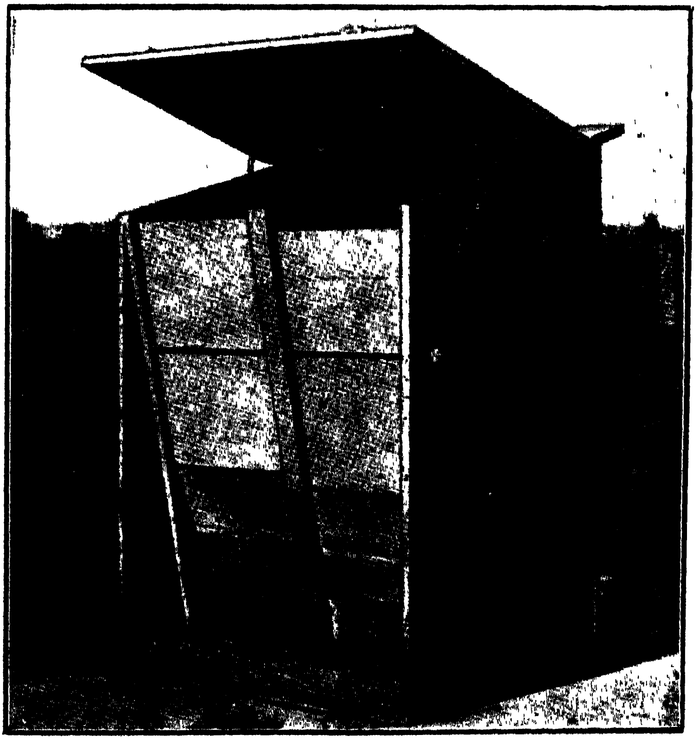
It is as a labour-saving device that self-feeders are of most value. Self-feeders are very suitable for topping off pigs over from 40 to 60 days. They are not so suitable for breeding pigs, owing to excess of fat induced and the short, junky fat pig being developed rather than the lengthy large-framed animal so necessary in breeders. In connection with pasture feeding, self-feeders are very successful. They must receive intelligent attention; they cannot be expected to save all the work. Plenty of water must be close handy to them.



The self feeder working.

Pigs must be brought to a high-eating capacity prior to being transferred to self-feeders. The majority of experiments carried out point to the fact that, while using more feed, results show the greatest gain per pound of feed consumed. Self-fed pigs gain rapidly and economically.

Professor John M .Evvard shows—from experiments—that self-fed pigs, weighing 125lbs. at the beginning of a test for a period of 76 days, gained 2.05lbs. daily, as compared with 1.87lbs. hand-fed pigs (more than 10 per cent. increase), and ate more feed daily, showing that under this system of feeding, pigs work at higher speed. Self-fed pigs require less feed for 100 lbs. gain, or 449lbs. as compared with 469lbs.—a saving of 20lbs. of maize on every 100lbs. gain with young pigs 10 weeks old at beginning of test. Self-fed for 100 days against hand-fed pigs showed with a self-feeder a daily gain of 1.13lbs., and required 408lbs. of feed for 100lbs. gain. The hand-fed pigs gained .59lb. daily, and required 430lbs. of feed for 100lbs. gain. The self-feeder on pasture showed that it took only 120 days to build up 53lb. pigs to 225lb. pigs as against 148 days for similar weight pigs hand-fed.



A cheaply made hinged-door Self Feeder.

SELF-FEEDING *VERSUS* HAND-FEEDING.

(CONDUCTED BY KANSAS AGRICULTURAL COLLEGE.

Feeding period—100 days.

—	10 Pigs Self-Feeders.	10 Pigs Hand-Feeders.
	lbs.	lbs.
Initial weight per pig	74	79·2
Final weight per pig	256·8	204·3
Gain per pig	182·8	125·1
Daily gain per pig	1·828	1·251
Daily ration per pig—		
Maize	5·95	4·77
Supplement	·32	·47
Feed required to make 100lbs. gain—		
Maize	325·71	381·29
Supplement	17·65	38·13

FEEDING FACTORS.

The principal basal grains in pig-feeding are maize, wheat, barley, rye, sorghum grains. Oats contain rather too much fibre.

Of supplementary foods skim milk stands par excellence—

5lbs. of skim milk equals 1lb. grain in feeding value.

10 gallons of skim milk equals 4lbs. pork: 1 bushel wheat equals 9-10lbs. pork = 14-15lbs.

10 gallons skim milk and 1 bushel wheat *fed together* means 18lbs. pork.

Feed 3 to 4 lbs. of skim milk to each 1lb. of grain.

Meat meal excellent supplementary feed, and is a by-product of lard and grease tanks, dried and mixed with blood.

Linseed oil meal splendid to use in combination with grains, pastures and milk. Do not feed alone; has been known to cause abortion.

Blood meal—dried blood 85 per cent. protein. Small quantities will arrest scours.

Pollard ranks next to skim milk and meat meal for pigs. Bran unsuitable : too bulky and fibrous.

Pig melons very good.

Potatoes good pig feed. Should be cooked. 4lbs. equals 1lb. grain, and makes a good substitute.

On an average it takes 4 to 5 lbs. of cereals to obtain 1lb. gain in weight of pig.

Ground grain shows 8 per cent. saving against unground grain. Soaked grain shows 10 per cent. saving against whole dry grain.

Cooking most foods for pigs shows a loss. Artichokes and potatoes similar in feeding value. Mangels : 8lbs. equals 1lb. cereal grain.

Common salt invigorates digestion. Wood ashes keep down stomach acidity; improves health.

If possible, rations should combine : grain, milk, pastures (or forage crops), meat or fish by-products.

WOOL CLIPS OF THE SOUTH-WEST.

By H. McCALLUM, Sheep and Wool Inspector, and L. SNOOK, Cadet.

One of the features of the last series of wool sales in Western Australia has been the fine display of wools from the South-Western portion of the State and the high prices realised for those that were carefully "got up." Despite the fact that it has been conclusively proved that the South-West is capable of producing wool of a type much in demand by wool-buyers, and returning a good profit per head of sheep, the clips from this area as a whole are considered by brokers and buyers to be the most carelessly classed lots submitted for sale. Of course there are farmers in this area whose classing is exceptionally well done, but they are in the minority. Why is this? Why should such a stigma be cast on this corner of our State—a corner that sends some of the finest of all our clips to the warehouses? It has sprung from three causes:—haphazard purchasing, tick-infested flocks, and—above all—negligence in classing. Let us consider the first cause enumerated above: Often the south-west farmer does not run a permanent flock, but buys, as occasion demands, the number of sheep he considers it profitable to pasture. He buys indiscriminately in the sale-yards, and as a result his flock consists not of one uniform type, or anything approaching that ideal, but a miscellaneous collection of numerous varying classes—just sheep. These assorted animals may serve the owner's purpose—the utilisation of seasonal fodder—just as well as a flock of good sheep, but they do not give the same return, nor do they provide an excuse for his sending the wool to the show floor in the condition he does, though the majority seem to think that because the flock is not a first-grade one they should spend no extra time on the clip. Prevention is better than cure, and the farmer's first move should be to buy as even a line of sheep as possible. The "mixed" flock is the root of much evil and makes the classing of a small clip infinitely more difficult.

The "occasional" sheep farmer is also often guilty of owning "ticky" sheep. He purchases (may-be in ignorance) tick-infested animals, and having no facilities for dipping he "lets them rip," especially as he has no intention of retaining them indefinitely. There is nothing more repugnant on the show floors than "ticky wool," and every farmer should make provision to dip his sheep or else make certain that the animals he purchases are clean.

The third and most apparent cause of the ill-repute of the South-West from a wool-broker's viewpoint is the deep, ingrained contempt of many growers for systematic wool classing. The Sheep and Wool Division of the Department of Agriculture and the various firms concerned have for years been spreading the doctrine of wool classing, and the State as a whole shows marked improvement in the "get up" of its clips, but the South-West is still the "Dark Corner." Some of its farmers cannot or will not be taught. It is pitiful to see some of the clips on the floors—lovely wool absolutely spoiled in value by mixing all lines. Good commercial Merino wool rolled up with fleeces from the English breeds of sheep; fleeces with skirtings still attached;

belly wool mixed in with the best fleece wool; and some of the fleeces are just rolled up as they come off the sheep and even tied round with twine. It shows distinct lack of business ability and pride in one's work when clips are sent to market in such a state, besides which there is a decided monetary loss.

The farmers concerned can have no excuse to offer. Even if they still run the mixed flocks previously criticised they should at least keep them free of tick and give a little time and common sense to classing their clip. It takes no experience to learn to keep the coarse crossbred fleeces out of the best merino bale; this, together with the skirting of the fleeces, will effect a big improvement. That this can be accomplished was clearly illustrated in one instance on the show floor last sales. One clip in particular showed out amongst its forlorn neighbours. It was from an ordinary South-West flock and had been "got up" by two young men who—though unversed in the handling of wool—had, by studying up all available literature and using their own judgment, made an excellent job of the classing. Theirs was the gain, for the classing is not merely for the convenience of the buyer, but results in much higher prices for the clips. If the farmers would only make a point of visiting the show floors of the wool warehouses at any time when in town prior to the sales, they could learn a lot and, by comparison of the catalogued lots, their arrangement, and the prices received, would see why their own clips failed to top the market.

1929 is Centenary year. What could be better to commemorate it than for the South-West farmers to determine that their clips will lead the way at the next season's sales, and with this object in view to work right through the present year and consequent shearing, adopting the proven practices of successful sheepmen. It can be done—but will it?

SHEEP MAGGOT FLY PARASITE.

(*Alysia manducator.*)

L. J. NEWMAN, F.E.S., Entomologist.

By arrangement with and through the courtesy of Dr. Guy Marshall, of the Imperial Bureau of Entomology, the Entomological Office received from England on the 24th December last a consignment of parasitised blowfly pupæ.

The material was consigned in cool storage and arrived in excellent condition. From the consignment some 250 parasites issued. These were in turn submitted to locally reared blowfly larvæ or maggots.

The result has been most encouraging, as we have had the pleasure of witnessing the issue up to date of some 180 locally-bred parasites. These in turn have again been worked in the laboratory where they have been put into cages with maggots of two species of blowfly, namely Lucilia sericata, European Greenbottle, and the Australian Greenbottle, Pycnosoma rufifacies.

This parasite is a shiny brownish black wasp, about ¼ inch long. The female lays a single egg in each maggot. This hatches into a legless larva within the body of the fly maggot. Eventually the fly maggot pupates in the soil. Instead, however, of a blowfly issuing capable of laying many hundreds of eggs, the adult wasp cuts its way out of the pupa and is in a day or two ready to lay eggs into other host maggots.

The parasite already established and distributed in thousands, namely, Nasonia brevicornis, attacks only the pupae, whereas the species now introduced attacks the larvae. The advantage is with the latter in that it gets to its host before it has buried itself in the soil.

The Nasonia is at a disadvantage in that it can only get at the pupae which are on the surface or lying under the carcase.

The conbined effect of the two, and other parasites, should they be successfully established, should do a great deal towards controlling this most destructive pest.

It behoves all those interested in the biological control of the blowflies to do all they can to assist the department in the breeding and distribution of these beneficial insects.

As indicating what can be done in this direction, copy of a letter received from Mr. A. Muir, a well known sheep breeder of the Mount Barker and Albany districts, is appended:—

"I saw by the papers that you were again importing some parasites for the Blowfly pest. Curiosity moved me to see what your previous effort had accomplished regarding *Nasonia brevicornis,* so I got some offal and put it out where I could watch the results. It was not long before I saw that the lively little wasp was still about. I am posting to you to-day some chrysalids, or pupae, of the blowfly, so that you can hatch them out and see if they are the same. You may remember the history of these wasps, as some years back you sent me some parasites when I lived at Forrest Hill. I then bred them in an open netted enclosure, adding the carcase of a kangaroo ocassionally to keep them going. I carried this out for over twelve months. We have found the parasites in dead bodies over four miles away from the homestead, so they must distribute themselves very well. When I came to Albany to live I brought some pupae from a dead sheep, got some offal, and bred them up for quite a long time; what I am sending you is the result. It is about two and a-half years since I bothered to see if they were about, so I was pleased to find them still here. Thus you will learn the benefit you have bestowed on the sheep-breeders by introducing those parasites, and, if you find them in what I have sent you, it will convince you that they are very hardy and adapt themselves to the crude conditions of the State.

While at Forrest Hill I distributed them to a great many people, besides breeding them at the other stations at Lake Muir and Warrungup on the Salt River district, so if they have lived, there should be a good spread of them.

Your endeavours to introduce parasites to this State deserve the best recognition possible. See for instance what a help the Chalcid wasp for Woolly Aphis has been to this State, also the Orange Scale parasite and many others."

TESTING MILK BY THE BABCOCK METHOD.

P. C. COUSINS,
Senior Herd Tester.

The Babcock Test was invented by Dr. Babcock of the Wisconsin Agricultural Experiment Station, U.S.A. The process was never patented having been given gratis to the world. In the process, which is both simple and accurate, only one re-agent—Sulphuric acid (1 82 specific gravity) is used).

It is important to know the fat content of milk in order to—

(a) determine the cost of production,
(b) determine the value of individual cows and the herd as a whole, and the elimination of the unprofitable cows,
(c) serve as a basis for the purchase of milk and cream,
(d) check unnecessary waste in skim milk, butter milk and whey.

Apparatus required for Testing Milk.

Babcock Centrifuge Machine
Babcock Milk Test Bottles
17.6 c.c. Milk Pipette
17.5 c.c. Acid Measure
Floating Dairy Thermometer
Dividers for measuring test
Hot Water Bath.

Taking the Sample.

Immediately after the cow has been milked out, the milk should be weighed and the weight recorded. The milk should then be thoroughly mixed by pouring from one vessel to another three times and the sample taken. Two ounces of well mixed milk put into a convenient wide mouthed bottle is a sufficient quantity. When the sample has been standing for some time the cream rises to the surface. The milk should be heated to 90° Fah. and thoroughly mixed. The temperature of the milk when pipetting into the test bottle should be 70° Fah.

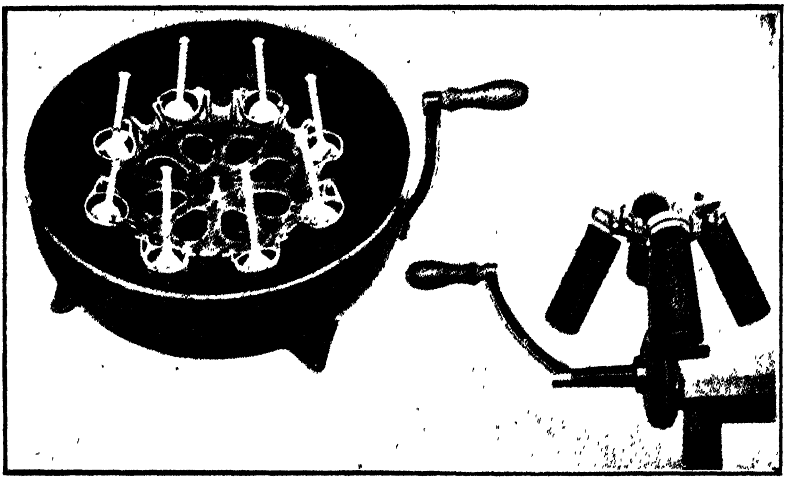
Measuring the Milk.

Insert the pipette into the well mixed sample and draw the milk above the mark on the large stem of the pipette. Quickly place the forefinger over the opening of the large stem, and, by releasing the pressure, allow the milk to flow out until the bottom of the slightly curved surface corresponds with the mark. Insert the pipette into the neck of the test bottle and allow it to drain. Blow out the last drop. If the small tube of the pipette cannot be inserted through the neck of the test bottle, hold the bottle at an angle of 60° and allow the milk to flow down the side of the bottle neck. This permits the escape of air from the bottle and so prevents any loss of milk.

Adding the Acid.

Fill the acid measure to 17.5 c.c. mark with sulphuric acid, and, while holding the bottle at an agle, turn it slowly adding the acid in such a way that all adhering milk is washed from the neck. The acid and milk form two distinct layers and must be thoroughly mixed by giving the bottle a rotary motion, the bottle being kept at an angle during the process to prevent spattering of the contents.

When acid is mixed with the milk it first precipitates the casein and albumen and then dissolves them. The dark brown colour is due to the charring of the milk sugar by the acid. Sulphuric acid aids the separation of fat from the milk serum by (1) overcoming the stickiness of the milk solids and setting the fat globules more free to collect in the neck of the test bottle; (2) by increasing the density of the milk serum; (3) by providing heat.



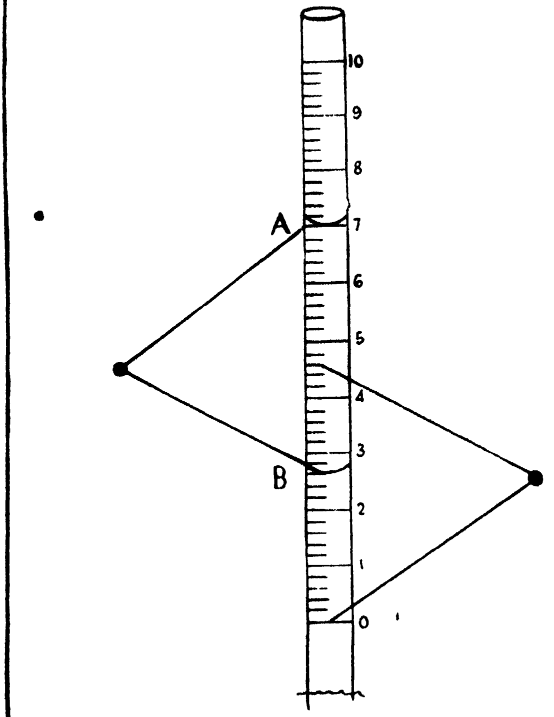
A Babcock Tester.

Making the Test.

Place bottles in the tester so that each bottle is counterbalanced by another placed directly opposite in the corresponding cup. Whirl the tester for five minutes at the speed indicated (in the case of four bottle machines the number of revolutions per minute is usually indicated on the handle, and of larger machines on the cover). Add hot water (180 deg. Fah.) to each test bottle, filling it to the base of the neck by allowing it to flow down the side of the neck. Whirl again for three minutes, then add sufficient hot water to bring the fat to the 8 per cent. graduation mark on the neck. Whirl again for two minutes.

Reading the Test.

Remove the bottles from the tester and place them in water heated to 140 deg. Fah. for a few minutes. The depth of the water should be equal to the height of the "fat column" in the bottles. Remove the bottles from the water bath, and, by means of dividers, measure the fat column. Read the lowest point "B" to the highest point "A" as per figure 1. Each large division as 1 to 2 to represents a whole per cent. of fat. Each of the smaller divisions represents a fifth or two-tenths of a per cent. Suppose the top register seven large and one small divisions, then "A" = 7.2 per cent. If "B" register two large and three small divisions, "B" = 2.6 per cent.; then 7.2 - 2.6 = 4.6 per cent. fat in the milk.



— FIG. I —

Centrifugal Action.

The fat is lighter than the milk serum, and, when the milk is whirled in the test bottles, there is a separation of milk fat from the milk serum. The serum goes to the outside of the circle of revolution, while the fat masses in the centre where it is finally collected in the graduated stem. Centrifugal action is well illustrated by whirlpools where all of the foam and light materials, as leaves, collect at the centre.

Factors affecting the Test.

The acid should have a specific gravity of 1.82 to 1.83. Acid should have the same temperature as the milk, i.e., 65 to 70 deg. Fah., and, when added to the milk, should be mixed at once. Acid which is cold or weak fails to dissolve the solids other than fat, and the fat column appears cloudy due to presence of undissolved curd. Acid which is too warm or too strong chars the fat, and the fat column appears dark.

The use of hard water causes foam on the top of the "fat column" due to the action of sulphuric acid on the carbonates in hard water. Preferably distilled water or rain water should be used, but, if this is not available, a few drops of sulphuric acid added to the hard water will overcome the difficulty.

The testing machine must be bedded on a firm foundation, as it is impossible to obtain a complete separation where there is excessive vibration. The speed of the machine must be maintained at the correct number of revolutions per minute for the stipulated time. Operating the machine unevenly or at too slow a speed causes incomplete separation, resulting in inaccurate tests. Excessive speed causes extreme tension on the test bottles which often results in breakages. Accurate results can be obtained only by paying strict attention to detail.

Computing Tests.

Morning and evening milkings should be tested separately, and each sample bottle should be marked with a serial number for identification.

Tests are computed as described below :—

——	Milk.		Test	Butter Fat	Butter Fat per day.		Butter Fat per month.	Milk per day.		Milk per month
	lbs		%	lbs.	lbs		lbs	lbs.		lbs.
Morning ...	17½	x	3 9	682	1·327	x 30 -	39 81	32½	x 30	975
Evening	15	x	4 3	645						

Date	Name of Cow		No. of Sample	Milk	Test.	Butter Fat.	Butter Fat per day	Futter Fat for sub-period	Milk per Day.	Milk for sub-period
				lbs.	%	lbs	lbs	lbs.	lbs	lbs.
30-6 28	Daisy ..	Morning	1	17½	3 9	·682	1·327	39 81	32½	975
30-6-28		Evening	2	15	4·3	·645				

When cows are milked at twelve hour intervals, there is very little variation in the morning and evening tests, usually half of a per cent. under normal conditions. With uneven periods of milking there is a wide variation in test between the long and short periods.

Precautions.

1. Sulphuric acid must be kept in stoppered containers of glass or earthenware and must not be allowed to come into contact with tin or metallic receptacles.
2. If acid is spilled on the hands wash it off immediately with cold water, and if spilled on clothing, rinse immediately with cold water, and then with dilute ammonia water.
3. Do not throw acid waste near plants or where human beings or stock are liable to walk. Acid burns.
4. Should it be neccesary to dilute the acid, pour it into the water stirring all the time. Never add water to acid—it will cause an explosion.
5. Label the acid bottle "Poison" and keep it in a safe place.

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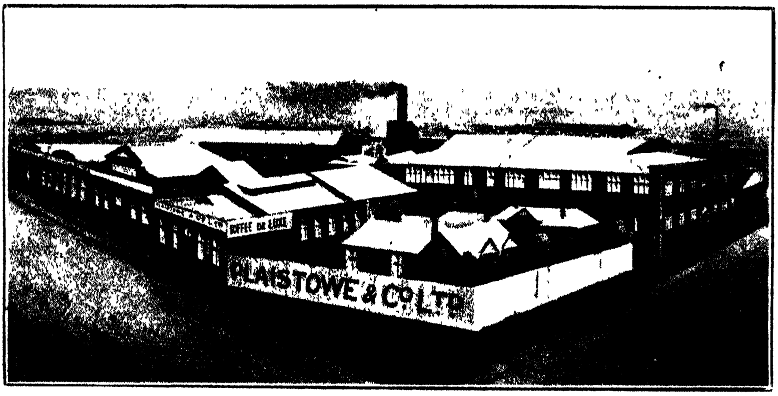


WEST AUSTRALIAN—Coal, Wood, Milk, Butter, Flour, Eggs and Nuts are used in Plaistowe's Factory.

Insist upon having PLAISTOWE'S when buying.

0—0

SCHOOL LUNCHES.

M. A. WYLIE,
Inspectress and Organiser, Domestic Science Classes, Education Dept.

As it is the duty of every person responsible for the feeding of others to seek knowledge and advice on food values, the importance of this article will be realised. The study of food is proving increasingly interesting.

Previous notes in this *Journal* on food have stressed the need of necessary substances to maintain health. Let us again see what they are:—

1. Body building and repair substances—nitrogenous foods and mineral matter—found in meat, fish, cheese, grains, vegetables, fruits and nuts.
2. Energy or fuel substances—starches, sugars, and fats—found in seeds (nuts), tubers, roots, fruits, and vegetables.
3. Vitamins—Nature's tonics, found in small amounts only, and are irregularly distributed among foods in their natural state.

When we remember that all important is the freshness, combination, quality, and quantity of food we prepare for those nearest and dearest it behoves us to give thought to the food question. The freshest and best quality foods contain the most vitamins. The appetite will be a good guide as to the quantity of lunch to cut up. The combination of foods should be studied, as some foods do not digest well when taken together. The old adage, "One man's meat is another man's poison," still holds good.

In most of our schools we find children who are away from home all day —necessitating mothers preparing "school lunch." Knowing that the nutritious school lunch should also be of such a nature as to prevent dental decay, we should eschew those foods which might be placed on the second rate food list—white flour, cornflour, polished rice, tinned goods, preserved meats and fish, sugar, vegetable oils, and some cheeses.

These contain practically *no* vitamins and should be avoided as far as possible. In the process of preparation these foodstuffs have been deprived of their living elements and to some extent of minerals and proteids.

Lunch on these lines is recommended:—

(a) One or two sandwiches, with a savoury filling as meat or fish, egg, grated or thinly sliced cheese, celery and nuts, or sliced apple.

(b) A similar sandwich with butter alone or very thinly spread honey, jam, raisins, marmalade, tomato, dates or figs.

(c) Wheaten meal scones, bran scones or nutbread with butter.

(d) Cocoa if available, milk or water, *not* tea.

(e) An apple or orange. Other fruit in season. Celery.

Note.—Never finish with a cake or biscuit.

Wheatmeal bread is much preferable to white, being more nutritious and less likely to cause dental decay.

Biscuits, chocolates, and sweets should not be taken at the end of a meal. These are prolific causes of dental decay.

Acid fruit, on the other hand, causes an abundant flow of saliva, and when taken at the end of a meal, is a *natural* preventative of dental decay.

A lunch of white bread and jam only is ill-balanced and un-hygienic.

Some points in packing lunches:

1. Every precaution should be taken to keep foods in lunch box or basket in good condition.
2. In hot weather, the use of soft moist food should be avoided.
3. Lunch wrappers, to be obtained now, are useful.
4. Each kind of food should be wrapped up in a separate parcel.
5. In packing, the foods less likely to crush should be placed at the bottom.

In making sandwiches for children leave the crusts on the bread. These need much mastication. The gums are thereby stimulated to send forth copious supplies of saliva, ensuring good digestion.

Egg filling for Sandwiches.

1 hard boiled egg.
½ teaspoon butter.
Pepper and salt to taste.
Any other flavouring to taste, as curry powder, chutney, or marmite.
Some slices of buttered bread.

Method:

Chop egg and mash till well broken up. Mix in butter, seasoning, and flavouring. Spread fairly thickly on bread. Press sandwich before cutting. Cut evenly with a sharp knife.

A Simply-made Cheese (Bath Cream Cheese).

1 gallon new milk, ½ gallon cold pure water. Enough rennet (junket tablet) to turn milk. More rennet is required if milk only is used.

Method:

Place water, milk, and rennet on a wet cloth lining a basin. When curd comes, gather up cloth, and tie up. Hang so that whey can drip into basin. Then pour some water over curd, and tie cloth again. Let whey drip through. When drained, place cloth with curd inside a vessel which it will fill, and put a weight on it. Apply dry cloths for a day or two. Turn cheese out on a plate, cover with another, and turn occasionally. It will be ready for use in a fortnight. Neither salt nor colouring are required.

Wheaten Meal Scones.

Ingredients:

1 cup plain flour.
1½ cups wheaten meal.
1 teaspoon carbonate of soda.
2 teaspoons cream of tartar.
2 ozs. butter.
1 teaspoon sugar.
1 cup milk.
¼ teaspoon salt.

Method:

1. Sift plain flour, rising and salt.
2. Add wheaten flour.
3. Rub in butter.
4. Add sugar and mix to a soft dough with milk.
5. Roll out 1 inch thick and cut in rounds.
6. Bake in a very hot oven 8 to 10 minutes.

Note.—Chopped dates may be added.

Nut Bread.

Ingredients:

1 tablespoon butter.
½ cup sugar.
1 egg.
½ cup chopped nuts.
1½ cups self-raising flour
½ cup milk.

Method:

1. Cream butter and sugar, add egg and beat well.
2. Stir in nuts and flour.
3. Add milk
4. Put into greased tins (a long tin—such as a cocoa tin). Fill about three-quarters full, put on lid, and bake in a moderate oven about one hour.

Bran Scones.

Ingredients:

1 cup flour.
2 cups bran.
1 cup milk.
1 egg.
1 teaspoon bi-carbonate of soda, dissolved in quarter of the milk.
1 or 2 tablespoons brown sugar.
1 or 2 ozs. butter, ¼ cup treacle or honey.

Method:

1. Beat eggs and sugar together.
2. Add treacle, melted butter, milk and soda.
3. Add flour and bran. Mix well. Roll out.
4. Bake in moderate oven about quarter hour.

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK YARDED AT METROPOLITAN FAT STOCK MARKETS FOR MONTHS OF DECEMBER, JANUARY, AND FEBRUARY, 1927-28.

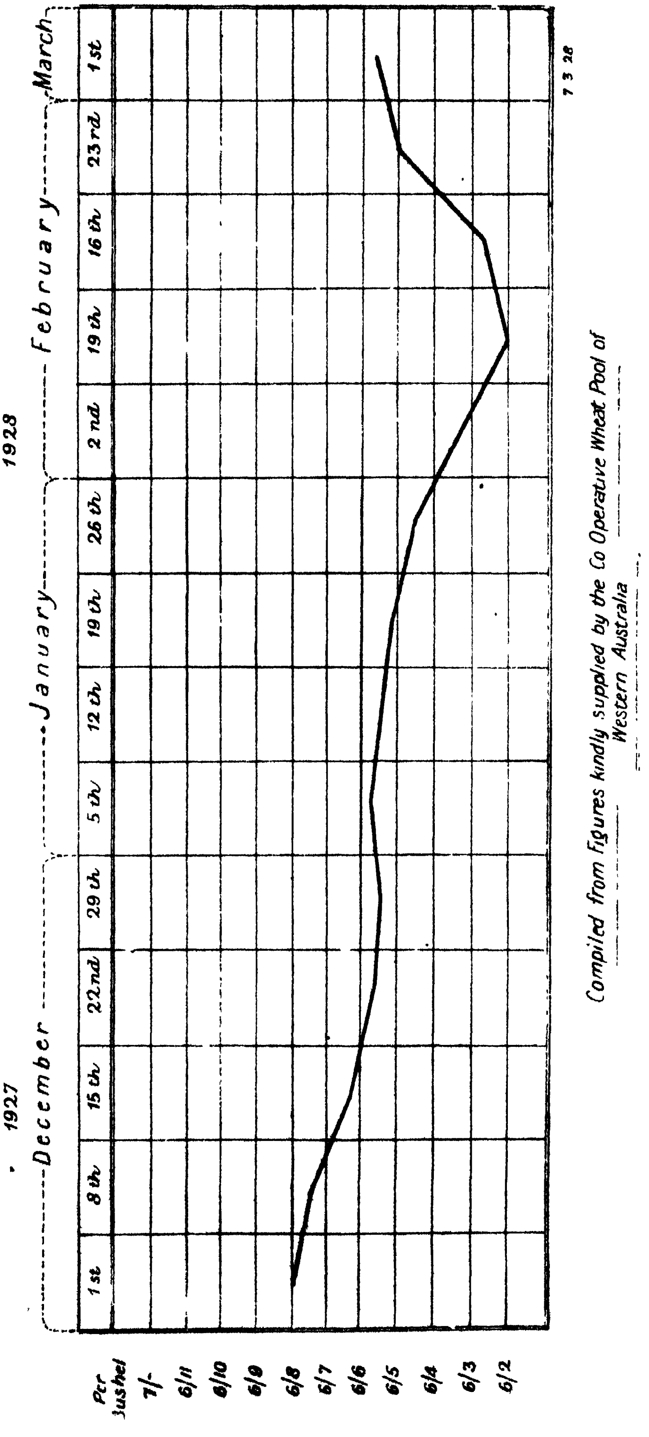
—	December, 1927.			January, 1928.				February, 1928.				
	7.	14.	21.	4	11.	18.	25.	1.	8.	15.	22.	29.
Sheep and Lambs	6,871	10,198	11,698	11,622	8,744	12,456	11,599	10,762	9,174	9,532	9,772	13,292
Cattle ..	880	927	1,156	667	720	731	608	628	742	672	809	791
Pigs	566	896	1,171	528	513	763	585	704	847	934	750	806

COMPARATIVE VALUES PER LB. OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS DURING THE MONTHS OF DECEMBER, JANUARY, AND FEBRUARY, 1927-28.

—	December, 1927.			January, 1928.				February, 1928.				
	7.	14	21.	4.	11	18.	25.	1.	8.	15.	22	29.
Mutton ..	5½	5¼	5¼	5½	6	5¾	5¾	5¾	6	6¾	7	6¾
Beef .. .	6	5½	5	5¼	5¼	6	6¼	6¼	6	6¼	6½	6
Pork	11¾	11¾	10¾	12	12	12	12	11¾	12	12	12	12
Bacon ..	9	9	8	8	9	8¾	9	9	9¼	9¼	9¼	9¼

RETURN OF WHEAT PRICES PER BUSHEL

C I F & E LONDON



Compiled from figures kindly supplied by the Co Operative Wheat Pool of Western Australia

MARKET REPORT.

The following particulars of the approximate quantity of chaff available for auction at the metropolitan chaff and grain sales, held in Perth during the months of December, January and February; also the minimum and maximum prices ruling for f.a.q. to prime wheaten, have been supplied by Messrs. H. J. Wigmore & Co., Ltd., of Wellington Street, Perth:—

December:
  Quantity—1,300 tons.
  Maximum price—£5 10s. per ton.
  Minimum price—£5 per ton.

January:
  Quantity—900 tons.
  Maximum price—£5 17s. 6d. per ton.
  Minimum price—£5 10s. per ton.

February:
  Quantity—1,450 tons.
  Maximum price—£5 15s. per ton.
  Minimum price—£5 2s. 6d. per ton.

It will be seen from the above that supplies arriving during the last three months have been far from heavy, and this being the case, one would naturally think that prices should have been somewhat higher. The cause of the comparatively low market, we think, is the fact that, according to statistics, a huge quantity of hay has been cut this season, and such being the case, both merchant and farmer do not feel inclined to hold, with the result that the market is weak, and consumers, not anticipating higher prices, are operating only from hand to mouth, competition being consequently extremely dull.

Owing chiefly to the truck shortage, the yarding for January was the smallest recorded for some considerable time, and the market during that month consequently improved, but immediately better supplies were available, it receded, the value of f.a.q. to prime at the time of writing, being £5 2s. 6d. to £5 5s. per ton.

Oaten Chaff: Right throughout the period under review, prime green Guyra oaten chaff has realised a higher price than wheaten of equal standard, f.a.q. oaten selling at about the same price as f.a.q. wheaten.

Oats: Several shipments of first-class quality Algerians have been made to the Eastern States, but during the last few weeks the Eastern markets have eased, and now there is little or no demand from that source. There has, however, been a fairly good local demand and this has helped to keep the market at satisfactory figures, the value of good heavy feed Algerians at time of writing being 3s. to 3s. 3d. per bushel; medium samples, 2s. 9d. to 2s. 10d. There is an excellent inquiry for good, stout lines of all varieties, suitable for seed, and consignments coming to auction would nett very satisfactory figures.

Wheat: The local market has fluctuated in sympathy with London, f.a.q. selling at certain auction during the last day or two at 5s. 5d. per bushel.

Barley: There is some inquiry for good, clean Cape, suitable for seed, at 3s. 6d. to 3s. 9d. per bushel; feed lines, 3s. 3d. to 3s. 4d.

METEOROLOGICAL INFORMATION.

STATIONS.	TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	DECEMBER, 1927.						JANUARY, 1928.						FEBRUARY, 1928.					
					inches.	inches.					inches	inches.					inches.	inches.
Chapman State Farm	92·3	106·3	63·8	55·6	·94	·21	93·8	104·2	63·7	55·4	·56	·28	92·3	105·1	68·1	54·9	*Nil*	·52
Geraldton	87·8	108·4	67·5	58·0	·88	·14	85·0	103·0	70·0	56·0	·44	·22	85·5	104·4	65·1	56·2	"	·30
Walebing	92·6	107·0	62·3	54·0	·14	·47	92·3	106·3	62·3	51·0	·57	·34	91·2	105·2	60·5	51·8	·02	·47
Perth	83·5	105·6	64·0	54·0	·19	57	85·1	99·7	62·6	52·0	·85	·34	84·3	98·8	61·5	53·8	·01	·45
Kalamunda	81·3	104·0	61·7	48·8	·33	·82	85·8	98·9	59·6	48·0	·87	·54	85·7	97·8	59·2	52·0	·07	·70
Bunbury	83·1	96·2	59·7	51·2	·19	60	81·5	90·2	58·5	47·4	·58	·44	79·4	87·8	56·8	49·8	·02	·57
Bridgetown	88·2	105·5	54·9	43·0	·16	80	86·6	103·0	54·0	42·5	1·56	·54	85·7	100·0	50·1	41·2	·05	·66
Albany	73·1	86·4	59·3	50·6	·40	1 16	70·9	80·4	59·1	52·4	2·50	·83	71·7	86·6	57·7	47·4	·12	·96
Merredin State Farm	96·2	104·3	62·1	52·5	·61	·60	90·0	107·1	61·5	47·2	·39	·60	89·7	103·8	59·3	48·2	*Nil*	·57
Northam	93·0	106·0	61·9	52·2	·43	·35	91·7	105·3	61·2	49·8	·57	·28	91·4	103·0	59·9	52·0	"	·40
York	91·5	106·2	60·5	53·0	·28	·43	90·5	106·8	59·5	48·5	·44	·32	89·9	103·2	58·4	52·0	"	·47
Narrogin State Farm	87·5	102·4	55·3	47·2	·82	·62	85·8	100·0	54·7	44·5	·53	·33	86·1	99·4	52·9	45·0	"	·60
Katanning	87·2	101·2	55·9	47·4	·90	·61	83·6	99·3	55·4	48·0	1·06	·36	84·2	98·2	54·2	47·0	·01	·57
Cape Leeuwin ...	72·7	81·0	61·7	58·0	·59	·88	72·5	77·5	61·9	54·8	·96	·69	72·8	81·2	61·7	57·2	·16	·89

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No. 223.—"*Pink Eye*" *or Ophthalmia in Sheep.* F. Murray-Jones. (Reprint from "Journal."

The following publication may be obtained from the Department of Agriculture, Perth, on application, or will be sent post free to any address in this State on receipt of a remittance for the amount stated :—

The Handbook of Horticulture and Viticulture of Western Australia, by A. Despeissis, M.R.A.C.

This publication contains valuable information dealing with all commercial fruits grown in Western Australia, including advice on planting, pruning, packing, manuring, fruit-drying, wine-making, insect and fungoid pests and their treatment, etc., and the whole forms a text book which every fruitgrower, whether large or small, should have in his possession. The price originally was 8s. 6d., but to allow of distribution being as wide as possible it has been reduced to 2s.

The Pruning of Fruit Trees, by J. F. Moody, Fruit Industries Commissioner:

This publication contains numerous illustrations, being reproduction of photographs taken in this State, of pruned and unpruned trees, which make the details set out in the letterpress particularly easy to understand. Price 2s. 6d.

Fruit Packing and the Marketing and Exporting of Fruit, by J. F. Moody, Fruit Industries Commissioner, and J. Ramage, Packing Instructor:

This publication contains invaluable information on packing and grading fruit for local and export markets. It is freely illustrated, and no fruit-packing shed should be without a copy. Price 1s. 6d.

The Poultry Keepers' Manual, by George Allman, Government Poultry Expert:

This is a most useful and valuable book, not only for beginners, but to all those who keep fowls for pleasure and profit. It deals fully with all matters connected with the industry, including Breeding, Feeding (for stock birds or egg production), Incubating, Brooding and care of chicks, Marketing (eggs and poultry), and all matters of use to the poultry-keeper. It also fully describes symptons of various ailments and diseases and simple treatment for same, and, as the book was written to suit *local conditions,* every poultry-keeper should have a copy by him. Price, 1s.

JOURNAL

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THE CENTENARY PRODUCTION EFFORT.

THE EDITOR.

In the year 1829 two of the first important events in the history of Western Australia occurred. On the 2nd May of that year Captain Charles H. Freemantle hoisted the British flag at the mouth of the Swan River, and thereby proclaimed this part of the World's smallest continent—or largest island, as the fancy pleases—another addition to the Realm of His Most Gracious Majesty King George the Fourth of Great Britain and his dominions. One month later, exactly to the day, Captain James Stirling arrived as Lieut.-Governor, and formally established the Swan River Settlement, the foundation of Perth and Fremantle, and the beginning of a great and valuable asset to the United Kingdom.

Next year, therefore, the first centenary of our history will have run its course, and there is a very natural desire on the part of all our people to mark the occasion by some fitting celebration. Numerous laudable schemes have been proposed, many of which will, without doubt, be carried into effect; but of all such surely none can make a stronger appeal to public sympathy and support than that advocated by the Minister of Agriculture and his officers, *i.e.,* the accomplishment of a record year of agricultural, horticultural, and pastoral production.

Of what use were it to add, as did Captain Freemantle, another territory to an already vast Empire if it were not only to be self-supporting, but a contributer to the many needed primary products of a great nation.

For long this part of the Australian Continent was disprized as a source of agricultural products. For the best part of a century it lay unheeded, except by a few sturdy pioneers; its capacity unconsidered, its magnificient timber resources unappreciated; regarded by the few who ever gave it a thought as a barren waterless waste, with perhaps a few oasis in widely scattered tracts. Then the lure of gold-bearing country called to the adventurous and Western Australia awoke. Men followed farther and farther inland in search of the precious metal and hitherto unsuspected possibilities became probabilites. It needed railways, so they were built. It required harbours, and so they were constructed. The mad dream of pumping water 350 miles inland ceased to be a chimera, and took form and shape. The thing was done. But water was not everything, and the need of a greater food supply for an ever-increasing population was soon apparent, and so farmers timorously stretched out a little farther from the coast line, and finding it good wondered how far they might yet proceed. Then came the scientific farmer instructor gathering in from anywhere sheaves of past experience, groping round for rainfall records, matching various patterns of country side and experimenting with soils and seeds and fertilisers and climatic conditions, instructing, directing and supervising, and behold the demand for food was being met with the local supply. Wheat especially studied and cultured, one bright year was found to be over produced, and a market was sought elsewhere. Then people began to tell each other here was a source of wealth that only required development to replace the fast-declining gold yield. Now when people tell each other things they begin to believe them, and when they believe them they set to work to bring them about, and it soon happened that the wheat farmers of the State found themselves with a few million bushels of wheat to spare, and as the time went on production and surplus continued to increase, so that last year's harvest was more than double that of little more than a decade ago; that is to say that a production of 16,000,000 bushels in 1916-17 last year had become a production of 35,000,000 bushels.

But all these things were quite impossible until they happened, and the only excuse they had for happening was that the Government of the day and their advisers in the Departments of Agrculture and Lands, and the farmers and populace of the State wanted them to happen, and made up their minds to it. The suggestion then that the centenary production shall surpass all preceding years, and more, that it shall almost double the production of the 1927-8 harvest so far as wheat is concerned, and reach a higher mark than the present record of any State in the Commonwealth is no more impossible of realisation than those past achievements to which we have already alluded. Fulfilment requires but three things: faith, works, and a propitious season; the first two man can supply, the third is in the lap of the gods. At all events we should with normal fortune attain to the 50,000,000 bushels sought by the Minister for Agriculture, Mr. Millington, when inaugurating the Centenary Production Campaign at Yandanooka in April last. Mr. Millington said, "In asking for a production of 50,000,000 bushels in the centenary year the State was not asking for anything impossible. This year the area under crop for grain was 2 812,208 acres. Last year there was an increase in the acreage under crop of 400,000 acres, and the department felt justified in estimating that there would be an increase this year of at least 500,000 acres. If this were realised a slight speeding up of the normal rate of progression would give an increase of 700,000 acres to be sown for grain in the autumn of 1929, and that would give a total of 4,000,000 acres under crop for wheat. The estimated average yield for the State this year was 12.3 bushels to the acre. If 4,000,000 acres gave an average return of 12.5 bushels, the goal set by the department would be attained."

That the objective of the campaign is not designed to be a mere spectacular leap forward on an occasion, but has a much deeper significance, was emphasised by the Director of Agriculture, Mr. Geo. Sutton, at the same function when he said, "This campaign is not being launched with the object of securing some abnormal increase of production in the centenary year. The idea is that this special effort to stimulate production shall be taken in our stride, that, having achieved our objective in the centenary year, we shall continue to progress at the same rate—a rate that is the envy of the other States of Australia."

The effort to produce this year must follow somewhat on the lines of our crop competitions of the past, but will differ in this respect that where these were restricted to those ambitious farmers who desired by hard work, skill, and good methods, to win honour and a prize apart from material benefits to be received, the centenary effort must be unrestricted. Each farmer is part of a great scheme. He cannot stand aloof because of indifference. The State's success in this effort is his own ultimate welfare. His pride, his sense of personal honour, his obligation to the Government under which he holds his land, and to his fellow farmers who are exerting themselves to the utmost, must compel his responsive co-operation. He must not, through his neglect, allow the result to fall one bushel short of possible achievement; if he does he will earn the scorn of all those whom he has let down. It may not be open to him to achieve his highest aim, but it is open to him, and he must by his thought and his planning and his labour, *deserve* success.

The throwing open of an additional 1,000 blocks of wheat land by the Minister for Lands (Mr. Troy) is a good step towards the success of the campaign, but more will yet be needed, and the surveyor and his assistants, the clearer and the contractor are all involved in the effort and must be stirred to enthusiasm. In the farming districts there should be local committees to assist in stirring up a district pride and creating an agricultural conscience. Watchful eyes should see to it that there are no slackers in the neighbourhood, and bad and slovenly methods should be fought like a pestilence. Victoria and South Australia are out to increase their wheat yield, and it is up to the farmers here to take up the challenge and prove their worth. There could be no more wholesome or better competition than for each State to try and outdo its neighbour in production. It would give the greatest impetus the Commonwealth had ever felt. And these remarks do not apply to wheat alone, for every branch of industry is equally important to our nationhood, and there are many branches that require acceleration before our own demands for their products can be overtaken. Let the agricultural, the horticultural, and the pastoral industry then "Go to it."

"Four things greater than all things are—
Woman and horses and power and war."

We first earned the highest tribute paid to woman by the Commonwealth in the success of our first Miss Australia. Our horses have built up reputations seldom beaten and rarely approached. Our soldiery stands on the highest pinnacle of fame, and in the field of sport our footballers and our oarsmen have proved equal to the best opponents the sister States can put forward. Are we lacking in power? If so, it is well to remember the nation that produces most of what the world wants will always be the ruling power.

A REVIEW.

"Classing the Clip."

Under this title Messrs. Angus and Robertson Ltd., have published a Handbook on Wool-classing by Mr. Clarence E. Cowley, Lecturer in Charge of the Sheep and Wool Department, Technical College, Sydney. The object has been to produce a text book, couched in simple language likely to be of use to those whose business it is either grow or class wool. This aim has been achieved by reproducing in an attractive form the lectures given by the author during the Sheep and Wool Course at the Technical College.

A wide field is covered ranging from the structure of wool and of other animal and vegetable textile fibres to the handling, classing and pressing of the many different types of wool met with throughout Australia, and particularly in New South Wales. To us in Western Australia where fastening the rolled fleece is rarely, if ever, thought of, and never advocated, it is interesting to find instructions for those who still desire to fasten their rolled fleeces with a goose neck.

Though the widely varying conditions in this State may not permit us to have the same standardised lines as are shown in this text book, the method of presenting these by the author is of great value, particularly as a staple of each line advocated is splendidly illustrated, as are also staples representing the spinning qualities of the various types A matter of special interest to the commercial wool grower, large or small, will be found in the section dealing with yield, and which includes a table showing the estimated average yield of 80 types of wool.

The volume is a welcome addition to the literature on this subject, and of value to students and others interested in our major primary industry. As pointed out by the author in his introduction—"It is, of course, impossible to acquire a thorough knowledge of wool without much practical experience. Actual handling and working of wool is essential in order to develop those faculties which play such an important part in the determination of quality, besides developing skill and quick judgment, which readily distinguish a well-equipped and competent wool-man," but as also further pointed out—"Supplementary knowledge gained from a text-book has great possibilities when supported by practical experience and keen observation. These should develop sufficient capacity, at any rate, to materially assist in the production of the right type of wool, and in its effective preparation for market."

RED CLOVER

(*Trifolium pratense Linn*).

G. K. BARON-HAY, C. A. GARDNER, and A. B. ADAMS.

Description.—Stock usually perennial, but varying from annual to perennial according to environment. Stems decumbent or nearly erect, one to two feet long, more or less hairy. Stipules rather large, ovate, veined, with long green points. Leaflets elliptical, obovate or obcordate usually on long petioles, almost entire. Flowers reddish-purple in large dense terminal avoid or globular heads with two sessile trifoliate leaves close to their base. Calyx tube obconical, villous, with four subulate hairy almost equal teeth, the fifth or lowest one about twice as long, the throat slightly narrowed internally by a hairy ring; standard exceeding the calyx, notched, wings and keel shorter. Fruit usually one-seeded, and differs from all other clovers except T. hybridum in the method of opening. The pod is a pyxidium which opens transversely, the lid breaking off with the base of the style attached, leaving a cup-like organ containing the seed which is thus easily shed.

The plant is native to Europe and Western Asia.

Red Clover is one of the oldest cultivated clovers, being known in Europe for over 400 years, and is included in most seed mixtures in those countries and in New Zealand. It has not been cultivated to any great extent in Western Australia but has become popular in the extreme South-West during the last three-four years, and the area sown should increase in the future.

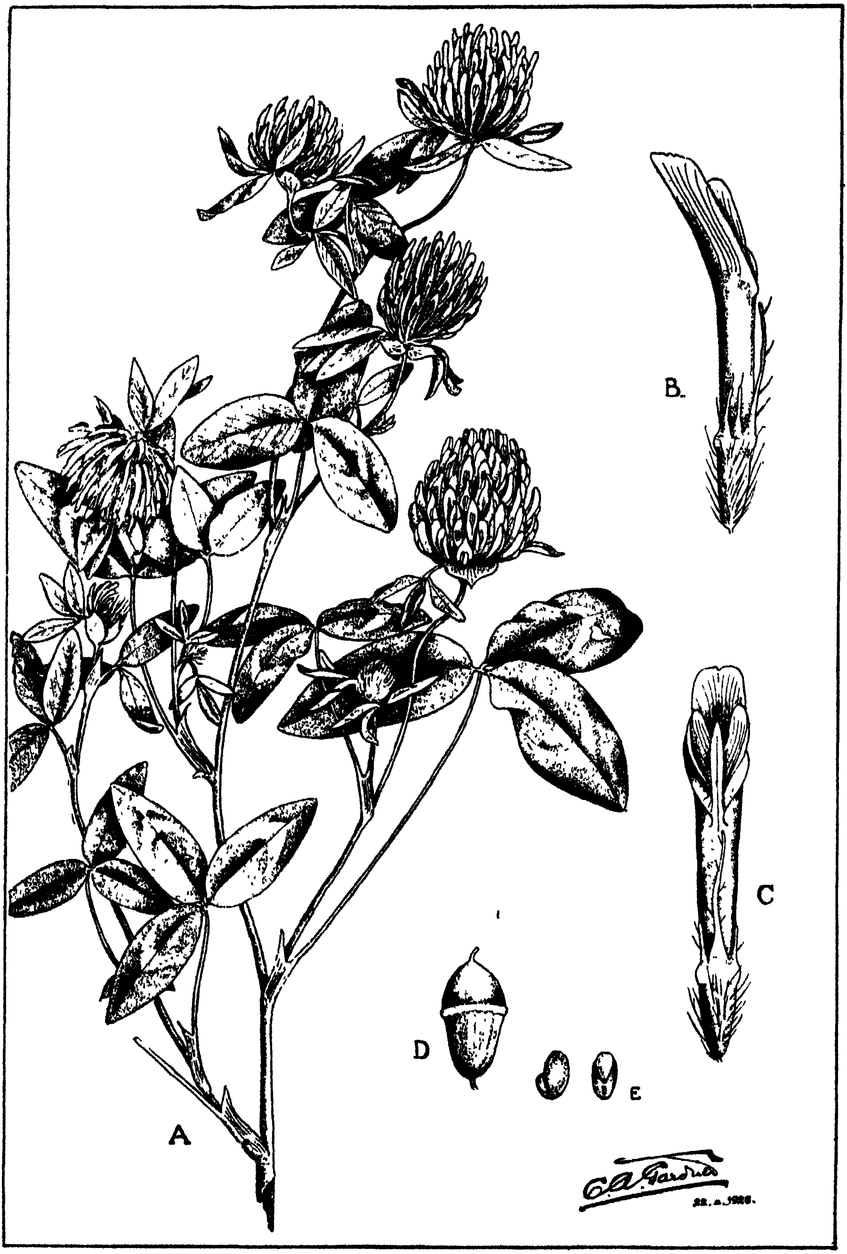
Red Clover prefers a cool climate, and thrives best on deep alluvial loam soils. Good results have been obtained, both alone and in mixtures, on the well-drained Karri hills in the extreme South-West of the State, especially around Denmark. Poor results are obtained on light loams and sandy soils.

When sown alone, 6-8 lbs. of seed per acre should be applied, reducing this quantity to 2-3 lbs. when sown in pasture mixtures or with a cereal crop, such as oats.

Red Clover is a useful addition to pasture mixtures, owing to its rapid growth the first season, thus ensuring a good "bite," the more permanent pasture plants, *e.g.*, White Dutch, Paspalum dilatatum and Subterranean clover gradually replacing it in subsequent years.

Seeding should be carried out on a firm seed bed, burying the seed 1 to 1½ inches deep, in early autumn, *e.g.*, March-April, applying 1 cwt. of superphosphate per acre. The permanency of most pasture plants in this State depends on their ability to form seed.

In Europe and New Zealand, Red Clover is fertilised by the Bumble Bee, which is absent in this State. Some other insect or insects apparently can fertilise the florets however, as Red Clover forms seed in Western Australia, though sparsely.



Red Clover. (*Trifolium pratense*, Linn.)

Explanation of Plate.

A. Habit. B. and C. Flower. D. Fruit, showing cap which falls off to liberate seeds. E. Seeds. B., C., D., and E. enlarged.

Flower heads obtained from Denmark, Western Australia, in February 1928, with a fair setting of seed showed the following germination results:—

Germination	7.5 per cent.
Hard Seeds	89.0 „ „
Dead Seeds	3.5 „ „
	100.0

Probably due in a large measure to the paucity of seed production and also to the dry summer, Red Clover seldom lasts more than two years in a pasture in Western Australia, especially if heavily grazed. It is very drought resistant, and will remain green during the summer in districts such as Denmark and Manjimup, and rapidly grows should a summer rain be obtained.

Red Clover may be cut for hay, but it is most important to cut the crop before seed production takes place. Cutting when the majority of plants are in full bloom is recommended, as the indigestible fibre rapidly increases after this period.

Properly cured Red Clover hay, with the leaf, is greatly appreciated by all stock, and is specially valuable to milch cattle. Where it is desired to grow Red Clover for green soiling or hay making the following method of management is worth a trial. Sow the clover seed with an oat crop, using 1½-2 bushels of oats and 8-10 lbs. of Red Clover seed. Fertilise with 180 lbs. superphosphate per acre.

The Oat crop may be cut for hay in the spring, while the clover will continue to grow and may be cut as green fodder for hay at a later date. The clover may be grazed lightly during the following winter, and may be cut for hay in early summer as in the previous year. Grazing should be very light during the summer months. The aim should be to cut for hay or green material, when at the correct stage of growth, rather than feeding off, if grown by this method.

Grown in this manner Red Clover will be found a good substitute for lucerne, which is rather difficult to establish on new country in the extreme South-West of the State.

"PHOSPHATE" OR "PHOSPHORIC ACID."

GEO. L. SUTTON,
Director of Agriculture.

In order that farmers may know the relative agricultural values of the different brands of superphosphate and other phosphatic manures which are offered for sale, the vendors in Western Australia and some of the other States are required to state and to guarantee the percentage of "Phosphoric Acid" (P_2O_5) which, respectively, they contain, and which determines the value of the fertiliser. In South Australia the vendors for the same reason are required to give the same information, but in that State the essential particulars are stated in another form, and the fertilising constituents are guaranteed as "Phosphate."

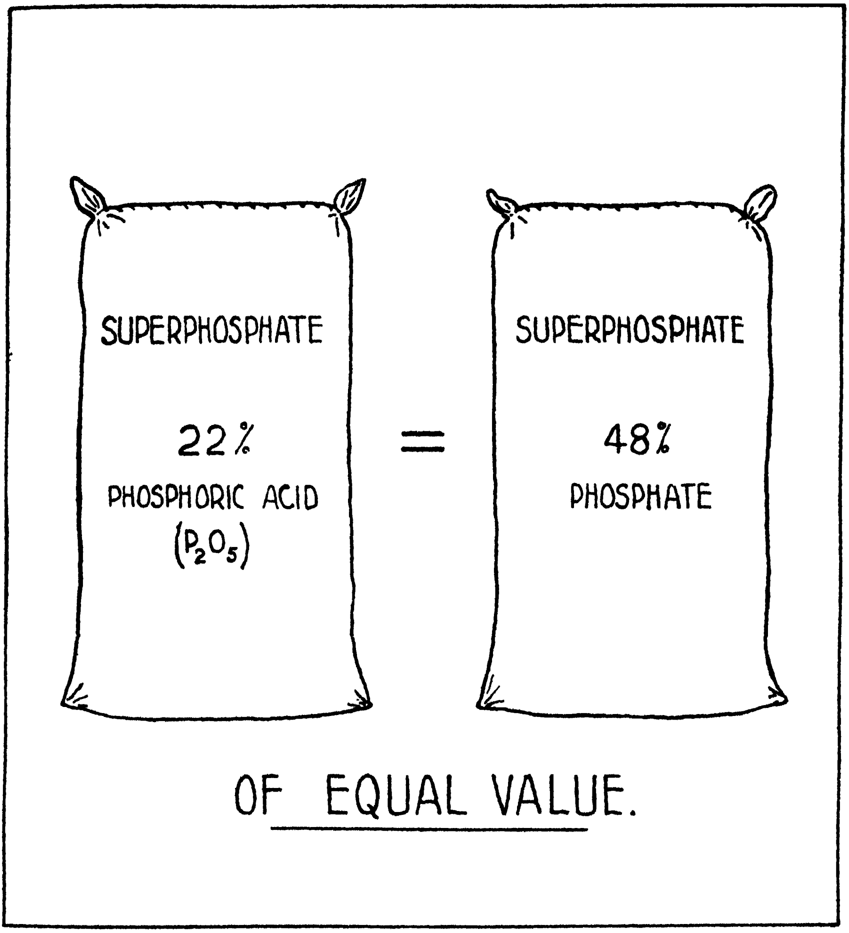
To the layman these terms have a certain similarity, but they differ widely in their value for comparative purposes, and in consequence their use is confusing to those not familiar with their relative chemical values. Without some knowledge on this latter point it is impossible to compare two phosphatic fertilisers of the same type, one of which has its contents expressed as "Phosphoric Acid," and the other its contents expressed as "Phosphate." For comparative purposes in assessing the value of phosphatic fertilisers, it may be stated that "Phosphoric Acid" has approximately 2⅕ times the value of "Phosphate."

In the fertiliser trade the term "Phosphate" is conventionally understood to mean Tri-calcic Phosphate of Lime. This is a compound of "Phosphoric Acid" in which there are three parts of Lime united with one of "Phosphoric Acid." It is obvious, therefore, that "Phosphate" is greater and heavier than "Phosphoric Acid," and in consequence the number expressing the fertilising value of superphosphate or other phosphatic manure as "Phosphate" will be greater than if the contents be expressed as "Phosphoric Acid."

Having regard to the molecular weight of "Phosphate" and "Phosphoric Acid" it is found that a unit of "Phosphoric Acid" may be represented by 142, and a unit of "Phosphate" by 310, *i.e.*, by an additional 168, which is the molecular weight of the three units of Lime which are united with the "Phosphoric Acid" to make the compound conventionally called "Phosphate."

The relative weights of "Phosphate" and "Phosphoric Acid" are, therefore, 310 and 142, or 2.18 and 1, so that superphosphate guaranteed to contain respectively 2.18 per cent. of "Phosphate" and 1 per cent. "Phosphoric Acid" would have the same value. It is, therefore, obvious that in the case of a phosphatic fertiliser, in which the plant food is expressed as "Phosphate." it will be necessary to divide the percentage of phosphate by 2.18 (roughly 2⅕) in order to compare it with a similar fertiliser in which the plant food is expressed as "Phosphoric Acid," thus a superphosphate guaranteed 45 per cent. "Phosphate" has less value than one guaranteed to contain 21 per cent. "Phosphoric Acid."

To those not familiar with the relative values of the terms "Phosphate" and "Phosphoric Acid" the agricultural value of a fertiliser with its contents expressed as "Phosphate" may appear of greater value than a similar fertiliser with its contents expressed as "Phosphoric Acid," though actually its value may be less. In the same way to one not acquainted with the fact that the Australian wheat sack holds slightly more than three bushels, one farmer's production of 3,000 bushels may appear greater than another's production of 1,100 bags.



In the following tables are shown the relative equivalent percentages of "Phosphate" and "Phosphoric Acid" (P_2O_5) over a limited range:—

TABLE A.

Phosphoric Acid.	Phosphate.	Phosphoric Acid.	Phosphate.
per cent.	per cent.	per cent.	per cent.
12	26.196	19	41.477
13	28.379	20	43.660
14	30.562	21	45.843
15	32.745	22	48.026
16	34.928	23	50.209
17	37.111	24	52.392
18	39.294	25	54.575

TABLE B.

Phosphate.	Phosphoric Acid.	Phosphate.	Phosphoric Acid.
per cent.	per cent.	per cent.	per cent.
24	10.993	38	17.406
26	11.909	40	18.322
28	12.825	42	19.238
30	13.741	44	20.154
32	14.658	46	21.070
34	15.574	48	21.987
36	16.490	50	22.903

"THE JOURNAL OF AGRICULTURE"

will be supplied free *on application* to any person in the State who is following Agricultural, Horticultural, or Viticultural pursuits, to Agricultural Societies or Associations, and to any person otherwise interested in Agriculture.

A charge of Threepence per copy will be made for the *Journal* to persons other than the foregoing, or who do not reside in the State. These applications, accompanied by the requisite amount, must be forwarded to the Director of Agriculture, Department of Agriculture, who will also receive all correspondence dealing with the conduct of the *Journal.*

Editors of agricultural and country papers are invited to reproduce any of the articles contained in this *Journal,* providing the usual acknowledgment is made.

If you are not receiving the *Journal,* which is issued quarterly, and wish to do so, please forward your name and postal address to the Director of Agriculture, Perth.

LEAF RUST OF STONE FRUITS.

(*Puccinia pruni-spinosae.*)

W. M. Carne,
Economic Botanist and Plant Pathologist.

Though Rust is of common occurrence on the leaves of peaches and nectarines, from January until the leaves fall, it cannot be regarded as an important disease in this State.

The leaves of almonds and plums are also affected, but to a lesser extent. Peaches which ripen very late in the season may have their fruits attacked. This occurs usually on seedlings, and is rare on commercial varieties.

The effect of Rust is to cause a premature fall of the leaves. With us, however, the disease becomes plentiful so late in the season that the leaf fall is too late to do serious damage to the buds which produce the flowers and growth of the following spring. Normally the disease is not marked until the fruit has been gathered and the buds well advanced towards maturity.

With humid summer conditions, Rust may become general earlier, but with our normal summer weather its incidence is delayed until the coming of more humid conditions in the autumn.

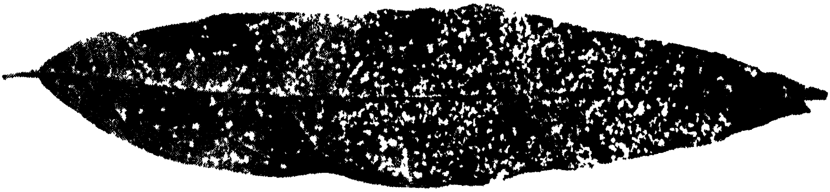


Plate I.

Upper surface of Peach Leaf showing yellow spotting due to Rust.

(Photo. N.S.W. Dept. Agric.)

Affected leaves may be recognised by more or less numerous yellow spots on the upper surface (Plate 1). On the under side and corresponding with these yellow spots, pustules are developed, which burst and expose dusty masses of minute rust—coloured spores (Plate 2). The spores (fungal seed-bodies) are the means by which the causal fungus is blown by the wind from leaf to leaf, or tree to tree, each being a potential source of infection.

PLATE II.
Under surface of Peach Leaf showing Rust pustules.
(Photo. N.S.W. Dept. Agric.)

The lower and older leaves first show signs of the disease, turn yellow and fall prematurely, leaving the upper and younger leaves at the end of the branches.

Peach fruits attacked by Rust become rough and scabby or spotted.

Although the premature loss of leaves must have some effect on the trees, there is not sufficient evidence of damage caused by Rust in this State to justify the adoption of any specific control measures.

At the same time, such routine practices as the burning of prunings and the ploughing under of the fallen leaves in the early spring should help to check the disease. Further, the use of a general purpose spray such as lime-sulphur, 1 gallon to 10 gallons water, applied before the buds swell, will assist to control Rust as well as the more serious Leaf Curl and Scale Insects, and will keep the trees free from lichens and algae.

THE BLOW-FLY MENACE.

H. McCallum,
Sheep and Wool Inspector.

The mortality amongst sheep from attacks of the Blow-fly is far more serious than the sheep farmers are aware; individually they are doing their best to eradicate this pest, but unless some general action is taken it may prove, sooner or later, to be a great danger to the pastoral industry.

In other countries it has been proved that the mortality amongst sheep through attack by the maggot fly is on the increase. Every country where sheep are bred has this pest in some form or other. With the increase of wool grown on each animal during the past few years there has been an accompanying increase in yolk and foreign matter, and these have proved a natural attraction for the fly.

When one comes to consider the history of the fly and that every maggot hatched will, if not destroyed, mean hundreds more in due course, it will be seen that it is an undertaking that means a lot of hard work for the sheep farmer. Fortunately at this time of the year the length of wool is not great and so the attraction is reduced, but all the same, there are sheep that are liable to be struck; therefore every good sheep man should crutch his sheep.

The loss in value of wool from sheep that have been struck by the fly is enormous, and this alone is sufficient incentive for the sheep-owner to vigorously combat the pest. The amount of wool that is taken from sheep by crutching every year alone runs into big money and though the wool in many cases may not be trimmed off it has, after treatment for the fly, a low value on account of being discoloured and only fit to put in with the lowest grades.

Every insect instinctively does its best for its young and the fly, therefore, seeks a place that will not only give security for its eggs but also provide food for the maggots when hatched.

When the seasonal green feed comes forth sheep are inclined to gorge and so cause a certain amount of scouring, and the state of their hindquarters is a great attraction for the fly to lay her eggs, but it is not only the hindquarters of the animal that the fly will strike, for in the folds on the neck and even about the head maggots are often found. Some sheep, whether it is that they issue forth an attractive kind of yolk or have some other peculiarity, are more prone to attack, and these should be always marked for future examination and eventual disposal for they are of little value to the flock owner.

The carcases of dead animals should be quickly disposed of, preferably by burning, but if no facilities for this are handy by burying deeply. This does away with one great breeding ground.

When sheep are slaughtered for food the entrails and other parts are often left lying where the animal is killed and quickly form a breeding spot. Then again the sheep skin often is neglected instead of being stretched out and decomposition sets in the overlapping parts, soon attracting the fly.

Rigid farm sanitation will greatly facilitate the eradication of the fly, and it is imperative that the farmer should attend to all details so simple and yet so necessary. The foregoing constitute but some of the causes for the attack on the sheep and are the ones which can be easily remedied. Others which are harder to combat also play their part. Temperature and humidity are big factors, and after rain or a heavy thunderstorm, when the air is muggy, the fly becomes very active and will strike a sheep on almost any part of the body. This is the time when the flock itself wants careful watching. Rams when being mated with the ewes, require to be well inspected and in many cases it will be found necessary to trim them. It is always safer to do this before mating them to the ewes, as a ram struck and carrying maggots in his wool is very apt to convey them to the ewe when serving. To ensure a good lambing it is absolutely essential that the rams and ewes should be clean and healthy at the time of mating.

Signs of a "Strike".—Without yarding the flock it is an easy matter to tell when sheep are struck by just standing off and watching them for a short time. Here and there they will be seen rubbing themselves in the same way as they do for lice; stamping; trying to reach their hind-quarters with their mouths; and, in the case of rams struck on the belly, trying to scratch themselves with their hoofs. The animals struck should be carefully examined all over and at the part where the maggots are found the wool will be wet and discoloured. In many cases the maggots will not be visible if the staple is long, but on opening up the wool to the skin they will easily be seen and on clipping the wool away a raw patch will be revealed where the maggots have been eating into the skin.

This is the cause of the unrest in the sheep. The injured parts should be carefully treated and they will soon heal.

Treatment and Prevention.—For killing the fly and maggots there are many useful preparations sold by the leading stock firms and every farmer should have some on hand, and treat affected animals as soon as possible after their being struck. This will greatly minimise losses, but of course, will not exterminate the pest. Dipping at the correct time goes a long way to check the fly, as the wool so treated contains a certain amount of poisonous substance and is unattractive to the parent fly. If well fed and provided with a good lick to purify the blood the sheep will lose their attraction to the fly and the percentage of attacks will be greatly reduced. The use of fly traps and poison around watering places, sheep yards and killing pens will also prove invaluable in combating this pest. It is only by a systematic attack at the root of this trouble—the breedtng places—that the possibilities for the spread of the fly can be eliminated. As with all other things, prevention is better than cure, and prevention in this case can only be effected by the united effort on the part of all farmers to see that all possible breeding places are destroyed.

EXPERIMENTS ON THE FERTILISATION OF THE EGG OF THE QUEEN BEE.

H. WILLOUGHBY LANCE,
Apiculturist.

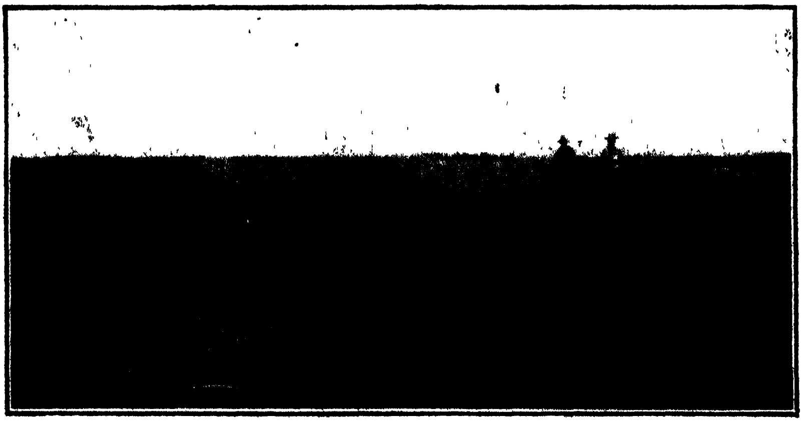
There is one item of the economy of the hive that is always of interest to beekeepers and scientists. That is the laying by the queen of female eggs in worker cells and of male eggs in drone cells. The popular theory for many years has been that it is not a question of selection by the queen, but that it is due to the physical properties of the queen and the size of the cells. The theory was, that owing to the small size of the worker cells, when the queen inserted her abdomen into the cell for the purpose of depositing the egg the edge of the cell pressed on the under portion of her abdomen, causing the sperm duct to open and fertilise the egg as it passed through the oviduct. In the case of drone cells, the cell being larger the abdomen was not pressed by the edge of the cell and the sperm duct did not open, so that the egg passed through unfertilised and produced a male.

Experiments made by O. R. Jordan of Bohemia, and reported in the "Bee World," distinctly proves the above theory erroneous. In one experiment a young queen was put on a comb consisting entirely of drone cells, in an observatory hive. The queen ran around the comb looking for worker cells; not finding any, she laid in the drone cells, and in due time these eggs hatched out and everyone of them brought forth a worker. The experiment was repeated with a one-year old queen with the same result. Mr. Jordan made very elaborate measurements of worker and drone cells, and intermediate cells often built at junction of worker and drone comb, also of queens with three different types of bodies. Old and new combs were measured, and it was found that the largest worker cells were larger than the smallest drone cells. If the pressure theory were correct, it would mean that out of the larger worker cells only drones could proceed, and out of the smaller drone cells only workers, which would lead to a change in the use of the cells as they became older. Comparisons were made between the various queens by means of diagrams which would show that a large queen could not avoid pressure in a small drone cell, and therefore could only lay fertilised eggs; a small queen, on the other hand, laying in large worker cells would only lay unfertilised eggs; but neither the one nor the other case occurs.

The experiments were very elaborate and extended over three years. One very interesting observation was made last year; Mr. Jordan possessed three combs on which, as rarely happens, the change from worker to drone cells was quite gradual. The centre was composed of worker cells; next there was a band of cells of increasing size, and on the outside, drone cells. One of these combs was put into a strong stock next to the outside comb. The first and second batches of brood were workers up to the drone cells; that is the intermediate cells had worker brood in them. In the third batch drones were reared almost up to the worker cells. That meant the intermediate cells were twice used for worker brood and once for drone.

This experiment seems very valuable as it proved that the queen had the power of laying fertilised or unfertilised eggs at will. What actually influences the insemination of the egg has not yet been discovered. The experiments would go to prove that the queen knowingly participates in the insemination and also instinctively knows that fertilised eggs should go into worker cells, and finding only drone cells is confused, and cannot understand why the bees have only built drone cells. Knowing, however, that she requires workers to build up the colony she lays worker eggs in the cells provided.

In what manner the queen is able to discriminate between male and female eggs may not be discovered, but the pressure theory is certainly discounted by the above experiments.



NITROGEN FIXATION AND AGRICULTURE.

R. G. LAPSLEY, B.Sc.Agr., A.A.C.I.

To the student of economics there are many signs that the question of raw materials for food and industry will profoundly affect, if not dominate international relationships, and the question of their supply is not an entirely economic one. Its ramifications penetrate into the spheres of human activity including those of science and its application. Chemistry, physics, physiology, botany and entomology all play their part in alleviating the consequences of Nature's somewhat haphazard distribution of the necessaries of life and progress.

From chemistry and physics we may expect most, for are they not showing us every day how to satisfy our primary needs by fabricating the raw materials of food, clothing and shelter from such simple materials as air, water, fuel and vegetation.

Of all man's basic needs food is the most important, and as man ever tends to multiply beyond his means of subsistence the old problem of food supply still awaits its solution, for as land suitable for agriculture is limited and its fertility gradually declining, the fertility must not only be restored but also increased to meet mankind's ever growing needs.

Civilisation through the health authority has made us abandon the economic practice of returning to the soil the unassimilated plant nutrients of our food (a practice followed by Germany during the war and by China from time immemorial), and as other organic manures are strictly limited in amount the only solution of this fertility problem, in which nitrogen plays a great part, is to manufacture our fertilisers from natural products. Apart from the Chilian nitrate deposits, which have a definitely limited life, and the wonder workings of the nitrogen-fixing bacteria in soils, the world is ill supplied with natural nitrogenous fertilisers. However, the chief raw material of these fertilisers—nitrogen—is itself extremely abundant in the atmosphere. Few human achievements can compare in importance with the recent work of the physical chemists and engineers in making this mine of potential fertility available for agricultural and other purposes. Of all the material factors which have helped to make the war the greatest and most devastating conflict in human history the possession by Germany of adequate plant for making synthetic ammonia by utilising atmospheric nitrogen, and of adequate personnel for operating it, was probably the most important.

The Sources of Supply of Combined Nitrogen.—Until comparatively recent times the principal sources of supply of combined nitrogen for fertilisers have been:—

(1) By-product sulphate of ammonia derived from the coal gas and coke industries; and

(2) The Chilian nitrate deposits (natural crude nitrate of soda, or "caliche").

As these two not inexhaustible sources of supply formed the bulk, the time had not seemed far distant when a world famine of fixed nitrogen would be in sight.

Modern chemical and engineering science has solved the problem of sufficient and cheap fixed nitrogen, and to-day we are able to draw on the almost inexhaustible supplies of atmospheric nitrogen for agricultural and other industrial purposes.

Nitrogen is an essential plant food.—Plant life is unable to directly assimilate free nitrogen from the air. It takes it in generally in the form of soluble inorganic nitrogenous materials from the soil solution. But occasionally it derives its nitrogen supply from products of nitrogen-fixing bacteria living symbiotically with certain specialised types of plants.

Air, a substance of great weight.—The ultimate source of nitrogen is the atmosphere which holds inexhaustible supplies, and the introduction of this new industry leads one to realise that air is not only a substance of importance to industry but is a material of enormous weight. If we say a cubic foot of air weighs 1¼ ozs. it does not sound much but it means a cubic yard weighs 2lbs. 2ozs. and a cubic mile of air over 5,000,000 tons. The whole atmosphere has been calculated to contain 4,000 billion tons of nitrogen. This enables one to realise the enormous weight of air resting on a country and the still greater weight amounting to many millions of million tons resting on the seas around such countries. All the air is free and anyone can draw on it. The supplies are practically unlimited, no matter how many millions of tons may be required for manufacturing processes in the future. The fact of the atmospheric circulation makes it continuously available at the plant, an economic advantage rendering costs of transport *nil.*

The atmospheric nitrogen-fixation industry has thus certain features which appear to give it the assurance of permanence and of very great future development. The raw materials with which it deals are cheap and plentiful and are common to all countries. No country is therefore able to obtain a monopoly except through its superior scientific knowledge and commercial ability. The main raw materials required are air. water, limestone and gypsum together with power which may be derived from fuel or water.

The synthetic production of ammonia now contributes about 75 per cent. of the world's supply of fixed nitrogen, and the industry is expanding at the rate of 100,000 tons of fixed nitrogen per year. Approximately 800,000 tons of fixed nitrogen is the present year's output forecast.

The marketable products of nitrogen fixation.—The fixation of nitrogen, whether by the arc, cyanamide or the ammonia processes, is generally only a first stage in the production of a marketable product. The nitric acid of the arc process is ordinarily converted into calcium nitrate or into ammonium nitrate by interaction with ammonia. Much of the cyanamide manufactured is converted into ammonia by digesting with dilute alkaline solution in high pressure autoclaves and the ammonia in turn being converted into sulphate or phosphate, or oxidised into nitric acid and so converted into nitrates.

Urea is also a product from commercial cyanamide. This latter is converted into free cyanamide by the action of CO_2 or other acids and the solution so obtained is transformed into urea by the action of dilute mineral acid.

Synthetic ammonia is converted into ammonium sulphate by interaction with sulphuric acid, or latterly by the gypsum process in use in Germany and England in which to a suspension of gypsum in a stirring apparatus sufficient ammonia and carbon dioxide are added to form sulphate of ammonia and carbonate of calcium. The latter is separated by filtration and used in the preparation of nitrate of calcium with the recovery of the carbon dioxide in the process.

There has recently been also a remarkable development in the conversion of synthetic ammonia into urea commenced by Germany in 1924. Ammonium carbonate is first produced by interaction of ammonia and carbon dioxide, and this is then transformed into urea by heating in an autoclave at 160°C. and 60 atmospheres pressure.

A commercial process for oxidising synthetic ammonia into nitric acid, a raw material for explosives and fertilisers as exemplified in the Ostwald oxidation process, has been successfully achieved and is normally carried out in conjunction with the Haber synthetic process. This oxidation process consists of the burning of ammonia in air under suitable conditions of temperature and in the presence of a catalyst and optimum gas velocity and the absorption in water of the acid produced.

In 1919 Germany recognised that nitrogen in ammonium compounds could not completely replace in agriculture nitrogen in nitrate compounds as in Chilian product, so to compete with it Germany produced synthetic nitrates of the same nitrogen content. Thus the marvellous growth of the nitrogen-fixation industry has excited those interested in the production of Chilian nitrate, the consumption of which has not advanced *pari-passu* with that of the artificial product, and it appears only a question of time for synthetic products to hold undisputed sway. The cost of producing synthetic nitrates is less than the cost of mining, concentrating and exporting the natural deposits in Chili. At present the amount of ammonia oxidised to nitric acid is a comparatively small proportion of the whole output of synthetic ammonia as the ammonium fertilisers still tend to be cheaper than the nitrate fertilisers.

Most of the fertilisers prepared from synthetic ammonia contain a higher percentage of nitrogen than any of the materials prepared from other sources, thus providing an increase in concentration of that fertilising constituent as well as combinations with potash and phosphate to form very concentrated fertilisers which have thereby very material economic advantages.

Many concentrated fertilisers and mixtures with potash and phosphate are now on the world's markets and their variety of form, low price and intensive propaganda seem to be the outstanding features of the trade.

The modern trend towards higher concentration may give rise to new problems. The older fertilisers derived from plant and animal by-products, or offal, or even inorganic fertilisers originating in natural deposits, contain greater or lesser amounts of accompanying impurities and are gradually becoming supplanted to some extent by the manufactured synthetic products of a high degree of purity. The application of these chemical fertilisers to the general run of soils containing sufficient of the lesser necessary inorganic constituents is not likely to involve any problems of deficiency from that source. But where these may be deficient or unavailable in soils the results of such deficiency in all probability may not be encountered with the cruder fertiliser materials as sufficient amounts of the necessary elements might be supplied as impurities.

Crude fertilisers may carry iron, manganese, arsenic, etc., etc. Future fertiliser practice must take into consideration the role of manganese and other elements which have been proved indispensable to plant growth and function, and provision must be made for determining soil deficiencies where they occur and meeting them with appropriate supplements to the pure fertilisers applied.

Next to Germany, Great Britain is the most important producer—
Germany, over 600,000 tons annually fixed N.
England, over 70,000 tons annually fixed N.

Not only are Germany and Great Britain the chief producers but they are the chief consumers, and are also the most important exporting countries.
Germany exports over 150,000 tons N per annum.
Great Britain exports over 50,000 tons N per annum.
(includes by-product N)

With the exception of Chili and Norway no other country has any important surplus of nitrogenous products.

Future development of the nitrogen-fixation industry.—The industry is of great interest both from an economical and a political standpoint. Economically the role of fertilisers will be to meet the world's growing demand, not only for food but for every kind of useful vegetable and animal product. Hitherto the increased demand has been met by extending the areas of the world under cultivation, but the time will come when all further gains must be obtained from higher yields which can only be achieved by scientific cultivation involving the use of fertilisers in greater quantities. It is highly probable that the increased nitrogen output will be supplied by the Haber process or by some modification of it, and that the industry will be developed in those countries which possess cheap fuel and good water communication. It seems certain that the greater part of the output will come from a few works, each operating on a very large scale and so requiring very great financial resources. The larger the scale on which the process can be operated, the more likely it is to be commercially successful, for not only must the process for the production of nitrogen and hydrogen be carried out on a great scale by means of very expensive plant, but the whole of the process has to be controlled by technicians of the highest skill and training. It is not commercially remunerative to employ such people unless they are placed in charge of plant capable of large production.

Although the tendency has been to increase the scale of operations and to employ to a greater extent persons with a scientific training, a new factor has been introduced into the industry by the entrance into it of the greatest and most powerful chemical firms in the world. These firms have in the past been mainly concerned with the production of dyes and other chemical manufactures in which they require to employ highly trained staffs. Under the control of these firms the fertiliser industry has become one of the highly skilled technical industries in which the employment not only of the most able and highly trained technicians will be required, but also the constant help of a staff of research workers. It is of importance to note that an international combine of such firms is at present under consideration.

Australia and nitrogen fixation.—All the leading agricultural experiment and research stations of the world are experimenting with these new manures in order to determine the advantages. They are being utilised to an amazing extent in Great Britain and the Continent and are making rapid headway into India and Asia and have reached Australia. The attitude of Australia towards these fertilisers should be one of great interest. Agriculture in the greater part of the coastal area of the Commonwealth is approaching the intensive system, and particularly is this so in the Eastern States where in Victoria the transition stage is well advanced. Heavier dressings of fertilisers are required, and the proportional content of nitrogen is ever on the increase. Apart from the all important question of our wheat lands the most important crop in Australia is grass, and the question of top-dressing with fertilisers is only in its infancy.

A nitrogen-fixation plant for and situated in Australia has been under consideration by our largest Australian firms and also by the British syndicate as instanced by the periodic agricultural delegations of experts throughout Australia. Apparently insufficient scientific information in respect to Australia's peculiar soil characteristics and the speeding up of nitrification is not forthcoming as a basis for a reliable computation of probable annual consumption of synthetic products. Australia is in need of a nitrogen-fixation plant for defence purposes and has been repeatedly urged by those qualified to speak, so we should look forward to the definite establishment in Australia of a nitrogen-fixation plant in the future.

The following table, showing the consumption of nitrogenous fertilisers in various countries, is based on information published by the Economic and Financial Section of the League of Nations:—

Pounds per Acre per Year.

EUROPE.	
Netherlands	38·2
Belgium	31·5
Germany	13·0
Denmark	8·7
Great Britain	7·1
Norway	4·8
Switzerland	4·6
France	4·3
Spain	2·8
Szechoslovakia	2·5
Sweden	2·3
Poland	1·2
Finland	0·9
Austria	0·8
Estonia	0·2
Hungary	0·1

ASIA.	
Japan	9·8
AFRICA.	
Egypt	8·1
South Africa	0·2
AMERICA.	
United States	1·8
Canada	0·3
Brazil	0·2
AUSTRALASIA.	
New Zealand	0·6
Australia	0·2

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2—4

FIELD EXPERIMENTS WITH WHEAT AT THE MERREDIN EXPERIMENT FARM.

I. THOMAS, Superintendent of Wheat Farms.

J. H. LANGFIELD, Manager Merredin Experiment Farm.

In addition to the results already published in the March issue of the *Journal of Agriculture*, the following field experiments were conducted at the Merredin Experiment Farm last year:—

With Wheat—
- Depth of Ploughing Experiment.
- Mulching Experiment.
- Fallowing Experiment.
- Seasonal Planting Experiment.

The land on which the experiments were conducted was a rich clay loam, typical of the gimlet and salmon gum forest country. Except where otherwise specified (to suit the requirements of the various experiments), the land was treated in the following manner:—

It was ploughed to a depth of four inches with a disc plough during June, 1926, and twice cultivated with a springtyne cultivator during the spring. After heavy March rains it was again springtyne cultivated and during early April cultivated with a tandem disc cultivator. Immediately prior to planting, the fallow was again cultivated with a springtyne implement.

The monthly rainfall as recorded at the farm for 1927, together with the average for the past 16 years, is shown hereunder:—

Year.	Jan	Feb.	Mar	Growing Period								Nov.	Dec	Total for Year.
				Apl.	May	June	July.	Aug.	Sep.	Oct.	Total			
1927 ...	9	2	565	36	53	164	132	89	167	64	669	19	61	1,361
Av. 16 yr.	59	53	85	78	128	174	189	138	92	81	802	37	50	1,174

Although heavy rains fell in March, some anxiety was experienced owing to the light rainfall received after planting. Germination was very uneven and it appeared as though some of the seed had malted. However, 38 points of rain fell on May 8th and a good germination resulted.

DEPTH OF PLOUGHING EXPERIMENT.

The object of this experiment which has been conducted continuously for the past 13 years (commenced 1915), is to determine the comparative effects upon resulting crops of ploughing the land different depths. Three plots were required for the experiment, and were ploughed as follows:—

Plot 1—4 inches, representing shallow ploughing;
Plot 2—6 inches, representing medium ploughing; and
Plot 3—8 inches, representing deep ploughing.

The plots were each one-eighth of an acre in area and were repeated eight times, three sections being cut for hay and five harvested for grain.

The plots were ploughed to their respective depths with a disc plough in June, 1927, twice cultivated in spring, and once in March, disc cultivated in April, and springtyne cultivated again in May.

The variety "Nabawa" was sown at the rate of 45lbs. of seed per acre, and superphosphate (22 per cent.) applied at the rate of 112lbs. per acre.

The results obtained last year, together with the average results for the past 13 years, are given hereunder:—

HAY YIELDS.

Variety "Nabawa." Seed, 45lbs. 112lbs. Superphosphate per acre.
Planted, 22nd April, 1927.

Treatment.	Computed Yield per Acre.			Average yield, 1927.	Percentage yield, 1927.	Percentage Yield.
	Section 1.	Section 2.	Section 3.			
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.		
Ploughed 4in. deep	42 2 24	41 2 8	41 0 16	41 3 6	105	105
Ploughed 6in. deep	39 3 12	39 2 0	39 1 20	39 2 11	100	100
Ploughed 8in. deep	44 1 12	44 3 4	45 1 12	44 3 9	113	105

GRAIN YIELDS.

Variety "Nabawa." Seed, 45lbs. Superphosphate, 112lbs per acre.
Planted, 22nd April, 1927.

Treatment	Computed Yield per Acre.										Average Yield, 1927.		Percentage Yield, 1927.	Percentage Yield.
	Section 1.		Section 2.		Section 3.		Section 4.		Section 5.					
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.		
Ploughed—														
4in. deep	31	36	31	20	32	0	32	40	32	56	32	6	101	104
6in. deep	31	36	31	28	31	52	31	12	32	48	31	47	100	100
8in. deep	31	4	30	56	31	28	32	0	31	52	31	28	99	100

The yields obtained from the grain plots this year are very even, and from these, together with the average results from this experiment for the past 13 years, it is obvious that there is no advantage gained by ploughing the land deeper than 4 inches for a grain crop.

In the hay section there was an increase in the plots ploughed to a depth of 8 inches. It is difficult to understand why this is so because the yield from plots ploughed 4 inches deep are greater than those obtained from the plots which were ploughed to a depth of 6 inches. In the percentage results for the past 13 years, the yields of the 4 inches and 8 inches ploughing are equal, and from these it can be concluded that over an average of years, provided the work is done thoroughly, 4-inch ploughing is the most economical depth.

MULCHING EXPERIMENT.

The object of this experiment is to determine how far and under what conditions the cultivation of winter fallowed land is profitable during the spring and summer. The land on which the experiment was conducted was ploughed in June, 1926, to a depth of 4 inches with a disc plough. Three plots were necessary, and to meet the requirements of the experiment, were treated as follows:—

Plot 1.—Cultivated during spring, again when required during summer after a fall of rain of 25 points or over, and again prior to seeding, the object being to maintain a mulch throughout the fallowed period and to destroy weed growth.

Plot 2.—Cultivated during spring and prior to seeding only (ordinary fallow).

Plot 3.—Cultivated just prior to seeding only (neglected fallow).

The plots, which were each one-eighth of an acre in area, were repeated eight times, three sections being cut for hay and five harvested for grain.

Plot 1 this year received no cultivation during the summer as no rain of any consequence fell until the latter end of that period. Towards the end of March it received one cultivation with a springtyne. During this month, although frequent falls of rain were experienced, the weather conditions did not permit of further cultivation.

However, it was cultivated again early in April and, together with Plots 2 and 3, just prior to seeding.

The surfaces of Plots 2 and 3, before being cultivated prior to seeding, were very hard and rough, requiring several extra cultivations to bring it to a desired seed bed. The germination of these plots was very uneven.

The experiment was planted on the 29th April, the variety "Nabawa" being sown at the rate of 45lbs. per acre with superphosphate (22 per cent.) at the rate of 100lbs. per acre.

The following table shows the results recorded for 1927 together with the average for 12 years:

HAY RESULTS.

Variety " Nabawa " Seed, 45lbs. Superphosphate, 100lbs. per acre.
Planted, 29th April, 1927.

Treatment.	Computed yields per acre.			Average Yield, 1927.	Percentage yield, 1927.	Percentage Yield.
	Section 1.	Section 2.	Section 3.			
	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.	cwt. qr. lb.		
Mulched in Spring, after rain during summer and before planting	41 2 0	42 1 12	46 2 8	43 0 3	91	103
Mulched in Spring, and before planting only	45 2 8	46 3 4	48 2 0	46 3 23	100	100
Mulched before planting only	42 0 0	45 3 4	46 0 16	44 2 16	95	98

GRAIN RESULTS.

Variety " Nabawa." Seed, 45lbs. Superphosphate, 100lbs. per acre.
Planted, 29th April, 1927.

Treatment.	Computed yield per acre.					Average Yield, 1927.	Percentage Yield, 1927.	Percentage Yield.
	Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.			
	bsh. lb.	bsh. lb.	bsh. lb.	bsh. lb.	bsh. lb.	bsh. lb.		
Mulched in Spring, after rain during summer and before planting	34 16	31 44	29 44	32 56	30 32	31 48	96	102
Mulched in Spring, and before seeding	33 20	33 12	33 44	33 20	31 36	33 2	100	100
Mulched before seeding only	31 36	32 24	32 16	30 56	31 36	31 45	96	94

The varying average yields from the three plots of this experiment this year are rather difficult to understand in view of the rainfall and the treatment of the plots during the fallowed period. The rainfall was such that the cultivation given to No. 1 plot was very little more than that given No. 2 plot. It is intended, however, to carry out investigations in the laboratory in connection with this experiment.

The percentage results for the past 12 years indicate that the general practice should be to cultivate the fallowed land in spring and again prior to seeding, and that in cases where the ground is weedy this cultivation should be supplemented by additional cutlivations after rain during the summer month, which not only assist to conserve moisture, but it also destroys weed growth and so assist to control the disease "Take-all."

EARLY AND LATE FALLOWING EXPERIMENT.

The object of this experiment is to determine whether early or late fallowing has any effect on the resultant wheat crop on heavy forest land. This is the fourth year that the experiment has been conducted.

Two plots were used, each half an acre in area, one-eighth of an acre being cut for hay and three-eighths harvested for grain. The early fallowed plot was ploughed 4 inches deep with a disc plough on the 4th June, 1926. The state of the land at this time was good for ploughing, the work being done under the most favourable conditions. The late fallowed plot was also ploughed to a depth of 4 inches on the 28th August, 1926. This plot turned up very lumpy owing to the land becoming somewhat hard, resulting in a much less vigorous and more uneven germination.

The variety "Nabawa" was sown at the rate of 45lbs. of seed per acre and superphosphate at the rate of 100lbs. per acre, on the 30th April, 1927.

Frequent patches of "Take-all" appeared in the late fallowed plot. This disease was also present to a small extent in the early fallowed plot.

The following tables show the yield for 1927, together with the average for the past four years:—

HAY YIELDS.

Variety "Nabawa." Seed, 45lbs. per acre. Superphosphate, 100lbs. per acre.

Date fallowed.	Computed Yield per acre, 1927.	Percentage, 1927.	Average, 4 years.	Percentage, 4 years.
	cwt. qr. lbs.	%	cwt. qr. lbs.	%
First week in June	45 0 8	100	38 2 4	100
Third week in August	38 0 24	85	31 3 16	83

GRAIN YIELDS.

Date fallowed.	Computed Yield per acre, 1927.	Percentage, 1927.	Average, 4 years.	Percentage, 4 years.
	bush. lbs.	%	bush. lbs.	%
First week in June	25 52	100	22 6	100
Third week in August	24 48	96	18 2	82

The heavy rains which fell in March, 1927, particularly favoured the late fallow. Since the moisture which had not been conserved by this fallow during 1926 was replaced by these March rains, the difference between the yields of the two plots is not so marked as that of previous years. However, the average results of the past four years are strongly in favour of the practice of early fallowing both for hay and for grain yields.

Some of the advantages of early fallowing are:—

(1.) Easier ploughing.

(2.) A better chance is afforded for the destruction of weeds.

(3.) More moisture is conserved in normal years by the longer period, thus providing a better insurance against dry spells at critical periods.

(4.) Early fallowing renders it possible to work the soil down to a better tilth, resulting in an even and strong germination.

(5.) Stimulates the production of nitrates and sweetens and aerates the soil.

(6.) Observations show that early fallowing helps to check "Take-all."

(7.) Increased yields. Over a period of four years the early fallowing has given an increased yield of 6cwts. 2qrs. 16lbs. for hay and 4 bushels 4lbs. for grain per acre.

SEASONAL PLANTING EXPERIMENT.

Three plantings are made in April, May and June, and the objects of the respective planting are as follow:—

April.—(a) To determine whether any other variety when planted in April is more prolific than the prinicipal variety Nabawa planted in May.

(b) To determine the variety most suitable for planting in April.

May.—To determine the variety whether Late, Midseason or Early most suitable for the principal planting in May.

June.—(a) To determine whether any other variety when planted in June is more prolific than the principal variety Nabawa planted in May.

(b) To determine the variety most suitable for planting in June.

APRIL PLANTING.

Seed, 45lbs. per acre. Superphosphate, 100lbs. per acre.

Date of Planting	Variety	Maturity.	Computed Yield per acre.										Average Yields, 1927.	
			Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.			
			bsh.	lb.	bsh.	lb.	bsh.	lb.	bsh.	lb.	bsh.	lb.	bsh.	lb.
April 21st	Canberra ...	Early ...	29	44	31	36	30	16	31	12	31	28	30	51
May 13th	Nabawa (Control)	Midseason	24	1[illegible]	24	40	24	0	24	0	24	32	24	17
April 21st	Joffre	Midseason	25	20	24	56	25	28	25	4	25	44	25	18
April 21st	Nabawa	Midseason	31	52	31	28	31	44	31	12	33	36	31	58
May 13th	Nabawa (Control)	Midseason	25	12	25	44	26	32	24	48	27	20	25	55
April 21st	Gallipoli	Late midseason						Yield	lost	by	hail.			
April 21st	Gluyas Early ...	Early ...	33	20	31	28	32	48	32	48	33	28	32	46
May 13th	Nabawa (Control)	Midseason	23	52	24	8	24	24	23	44	24	24	24	6
April 21st	Canberra ...	Early ...	29	36	28	48	30	32	31	12	32	26	30	30

MAY PLANTING.

Seed, 45lbs. per acre. Superphosphate, 100lbs. per acre.

Date of Planting.		Variety.	Maturity.	Computed Yield per acre.										Average Yield, 1927.	
				Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.			
				bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
May	14th	Canberra ...	Early ..	30	8	30	32	31	52	31	36	28	40	30	34
,,	13th	Nabawa (Control)	Midseason	28	0	28	16	29	28	29	52	30	24	29	12
,,	14th	Joffre	Midseason	22	0	24	16	25	36	25	4	24	48	24	21
,,	14th	Gallipoli	Late midseason			Yield		lost	by	hail.					
,,	13th	Nabawa (Control)	Midseason	26	48	30	8	29	44	30	24	28	32	29	7
,,	14th	Gresley	Early ...	23	20	24	48	25	52	25	12	24	24	24	43
,,	14th	Canberra ...	Early ...	28	0	27	4	29	20	28	40	27	36	28	8
,,	13th	Nabawa (Control)	Midseason	28	40	26	40	29	20	27	20	27	4	27	49
,,	14th	Carrabin ...	Early ...	32	40	30	24	34	24	32	24	32	24	32	27
,,	14th	Comeback ...	Early ...	23	4	22	48	26	0	24	24	22	40	23	47
,,	13th	Nabawa (Control)	Midseason	30	0	29	12	30	56	29	52	25	36	29	7
,,	14th	Merredin ..	Early ..	33	28	33	36	33	52	31	4	31	44	32	45
,,	14th	Gluyas Early ...	Early ...	32	24	34	8	32	56	32	16	32	8	32	46
,,	13th	Nabawa (Control)	Midseason	29	44	30	24	28	16	29	20	27	20	29	1
,,	14th	Noongar	Very Early	27	52	27	52	27	20	28	0	27	4	27	37

JUNE PLANTING.

Seed, 45lbs. per acre. Superphosphate, 100lbs. per acre.

Date of Planting.		Variety.	Maturity.	Computed Yield per acre.										Average Yield, 1927.	
				Sec. 1.		Sec. 2.		Sec 3.		Sec. 4.		Sec. 5.			
				bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
June	15th	Nabawa	Midseason	20	56	21	52	20	0	22	8	21	20	21	15
May	13th	Nabawa (Control)	Midseason	28	16	29	36	28	48	29	12	29	20	29	2
June	15th	Gluyas Early ...	Early ...	25	36	25	20	24	24	27	4	25	20	25	37
June	15th	Canberra ...	Early ...	21	44	22	8	20	8	22	48	21	52	21	44
May	13th	Nabawa (Control)	Midseason	28	40	28	32	27	12	28	48	27	28	28	8
June	15th	Merredin ...	Early ...	25	52	23	52	24	16	25	12	24	24	24	43
June	15th	Gresley	Early ...	18	8	17	52	19	12	18	40	19	20	18	38
May	13th	Nabawa (Control)	Midseason	26	56	27	44	28	16	28	16	29	12	28	5
June	15th	Carrabin ...	Early ...	24	40	24	48	27	12	Lost by hail		25	28	25	32
June	15th	S.H.J.	Very Early	23	4	24	24	26	24	25	44	24	40	24	55
May	13th	Nabawa (Control)	Midseason	25	52	28	8	30	24	29	28	27	44	28	19
June	15th	Noongar	Very Early	22	16	20	56	22	56	22	32	23	36	22	27

Like those of the Chapman and Wongan Hills Experiment Farms, the above results are for one year only and, consequently, no definite conclusions may be deduced.

As was also the case at Wongan Hills, all varieties in the April planting yielded better than the control plots of Nabawa planted in May. At Merredin, however, germination of the April plots was not general until after the first week in May. This would therefore interfere with the object of the experiment and detract from the value of the comparison.

However, the results indicate, as do those of the similar experiments at the Wongan Hills and Chapman Farms, that it is undesirable to delay planting operations until June.

FALLOW COMPETITIONS, 1928.

Judge—G. L. THROSSELL, Dipl. Agric., Agricultural Adviser.

In addition to the Fallow Competition of the Wyalcatchem Agricultural Society, the results of which were published in the March issue of the *Journal of Agriculture*, the following Agricultural Societies conducted fallow competitions during 1928:—

1. Nungarin Agricultural Society.
2. Doodlakine-Baandee Agricultural Society.
3. Bruce Rock Agricultural Society.

In connection with the judging of the Nungarin and Doodlakine-Baandee competitions the acknowledgments of the judge are due to the assistance rendered by Dr. Teakle, Plant Nutrition Officer.

NUNGARIN AGRICULTURAL SOCIETY.

One of the conditions of the 1928 Cropping Competition conducted by the Nungarin Agricultural Society is that only those competitors who had entered for the 50-acre Fallow Competition would be eligible to enter in the Cropping Competitions. No less than 15 entries were received for the Fallow Competition, an indication of the healthy rivalry which exists amongst the farmers in the district. An interesting point about this competition, and one which considerably enhances its value, was that almost without exception the 50-acre plot entered and judged was representative of the whole area fallowed by the exhibitors and had received practically the same cultivation. That is to say, the plots were strictly a commercial proposition, and not small specially prepared areas set aside for the competition.

Judging took place from February 16th-18th, inclusive, and the scale of points under which the awards were made was as follows:—

	Points.
Moisture	40
Mulch	10
Absence of Weeds	10
Consolidation	20
Uniformity of preparation ..	20
Total	100

The rainfall recorded from the time of fallowing until judging is shown in the table hereunder:—

——	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Total.
Nungarin ...	210	209	67	122	88	26	33	51	806
Lake Brown ...	140	202	78	178	24	22	23	31	707
Talgomine ...	210	192	110	174	49	16	7	30	788
Mukinbudin ...	219	226	70	173	22	18	13	63	804
Mangowine ...	309	236	100	135	28	50	15	119	992

The points awarded to the various competitiors are set out in the following table.

NUNGARIN AGRICULTURAL SOCIETY.

50-ACRE FALLOW COMPETITION—1928.

Competitor	Address.	Moisture. 40	Mulch. 10	Absence of Weeds. 10	Consolidation. 20	Uniformity of Preparation. 20	Total. 100
L. Dumsday ...	Talgomine ...	35	9	9	19	19	91
G. H. Herbert ...	Nungarin ...	35	9	7	19	19	89
F. A. Williams ...	Mangowine	35	9	7	18	19	88
G. T. Young ...	Talgomine ...	36	7	9	18	17	87
J. Mulqueeny ..	Lake Brown	34	8	10	17	18	87
Creagh Bros ...	Kwolkan ...	33	8	8	18	19	86
A. G. Reynolds	Mukinbudin	32	9	6	18	19	84
H. P. Jo'ly ...	Mangowine	30	7	8	17	19	81
C. W. LeVaux ...	Nungarin ...	29	7	8	18	18	80
J. H. Johnston ...	Mangowine	29	7	7	17	19	79
Watson Bros. ...	Nungarin ...	29	8	8	16	18	79
H. G. Payne ..	Nungarin ..	27	7	9	17	18	78
R. C Fitzpatrick	Nungarin ...	27	7	9	16	18	77
E. H. Goode ...	Mangowine	29	7	5	19	17	77
S. J. Benson ...	Nungarin ...	26	7	7	16	18	74

First place was gained by Mr. L. Dumsday, of Talgomine, with 91 points. The land, which originally carried tea-tree and gimlet, was ploughed with a disc plough to a depth of 3½ inches in July. It was scarified with a Gersch scarifier in August, and then harrowed after rain in November. This fallow was in very good condition when inspected. The moisture content was high and found just beneath the consolidated seed bed, which was covered by a nice even mulch about 2½ inches deep. A little barley grass was noticed. The seed bed was well consolidated and the whole fallow very uniformly prepared, and well deserved the position which it gained in the competition.

Mr. G. H. Herbert gained second place with 89 points. His land was grey morrel. He scarified it to a depth of 2½ inches in June and then cross-scarified it again in August, the last working being shallower than the first. By working his land in this manner, Mr. Herbert has obtained a well consolidated seed bed for this class of country. The moisture content was as good as the winning entry, though not quite so near the surface. A nice shallow mulch was obtained, but the chief fault was the presence of a fair amount of barley grass which had gone to seed.

Mr. F. A. Williams was placed third with 88 points. His entry was salmon and gimlet country and was ploughed in July with a mouldboard to a depth of 4 inches. It was harrowed with a heavy set of harrows in August, and cultivated with a Gersch duck-foot scarifier in September. The moisture content was good and the mulch was in good tilth but a little deep in places. The "Summer Thistle" or "Potato Weed" (*Solanum hoplopetalum*) was rather bad in places. The seed bed was not so well consolidated as it might have been, while at one end, where it was apparently extra wet, when ploughed, it was rather cloddy. The following table shows the cultural methods employed by the competitors:—

NUNGARIN AGRICULTURAL SOCIETY.

CULTURAL METHODS.

Competitor ...	L. Dumsday.	G. H. Herbert.	F. A. Williams.	G. T. Young.	J. Mulqueeny.
Timber ...	Tea-tree and Gimlet	Morrel	Salmon and Gimlet	Salmon and Gimlet	Gimlet and Mallee
Ploughed ...	July	June	July	July	July
Make of Plough	Disc	Scarifier	Mouldboard	Mouldboard	Disc
Depth ...	3½ inches	2½ inches	4 inches	3 to 4 inches	3 to 4 inches
Cultivation ...	Scarified in August with Gersch scarifier. Harrowed in November	Cross scarified in August	Harrowed in August. Cultivated in September with a Duckfoot scarifier	Skim ploughed in September with a Sundercut	Springtooth cultivated in October.

Competitor ...	Creagh Bros.	A. G. Reynolds.	H. P. Jolly.	C. W. Le Vaux.	J. H. Johnston.
Timber ...	Salmon and Gimlet	Salmon and Gimlet, mostly Salmon	Salmon, Gimlet and Morrell	Jam and Tea-tree	Salmon and Gimlet
Ploughed ...	Middle July	Early June	End July	July	End June
Make of Plough	Disc	Mouldboard	Mouldboard	Mouldboard	Disc
Depth ...	3 to 4 inches	3 to 4 inches	3½ inches	4 inches	4 inches
Cultivation ...	Skim ploughed in October	Duckfoot cultivated in August. Harrowed in September and cultivated in October	Sundercut in October, harrowed in November	Springtooth cultivated in September	Sundercut in August and again second week in February

Competitor ...	Watson Bros.	H. G. Payne.	R. C. Fitzpatrick	E. H. Goode	S. J. Benson.
Timber ...	Salmon and Morrel	Salmon and Gimlet	Jam, Mallee, scattered Salmon and Gimlet	Morrel and Salmon	Salmon and Morrel
Ploughed ...	...	End July	July	July	August
Make of Plough	...	Disc	Disc	Disc	Sundercut
Depth ...	...	4 inches	4 inches	3 inches	3 to 4 inches
Cultivation ...	...	Sundercut end Sept. Tandem disced middle February	Sundercut in August and September	Cross ploughed immediately after, Springtooth cultivated in August	Cross cultivated with Sundercut beginning of October

BRUCE ROCK AND DISTRICT AGRICULTURAL SOCIETY CROP AND FALLOW COMPETITION, 1928.

The Fallow Competition.

Ten entries were received for the 50-acre Crop and Fallow Competition conducted this year by the Bruce Rock and District Agricultural Society. The fallows were judged during the third week in March (19th-21st, inclusive), after what is considered to have been one of the driest summers for many years.

The scale of points upon which the awards were made is as follows:—

	Points.
Moisture	40
Mulch	10
Freedom from weeds	10
Consolidation	20
Uniformity of preparation ..	20
Total	100

The following table shows the rainfall recorded from June till March at the centres nearest to the competitors.

Centre.	Fallowing rains.				Spring Rains.				Summer Rains.				Total Rain fall.
	June.	July.	Aug.	Total.	Sep.	Oct.	Nov.	Total.	Dec.	Jan.	Feb.	Total.	
Belka	188	201	128	512	180	41	...	221	25	25		50	783
Bruce Rock ...	176	158	138	467	172	71	23	266	29	16	..	45	778
Central Kuminin	185	165	118	468	76	160	10	246	...	56	.	56	770
(Lovell Hill), Yarding	205	206	107	518	175	53	22	250	28	20	..	57	825
Shackleton ..	228	209	130	567	158	64	29	251	16	118	.	134	952
Babakin ...	221	208	144	573	187	94	27	308	24	26	.	50	931

The following table gives the points awarded to the various competitors:—

BRUCE ROCK AND DISTRICT AGRICULTURAL SOCIETY.

CROP AND FALLOW COMPETITION—1928.

Points for Fallow.

Competitor.	Address.	Moisture. 40	Mulch. 10	Absence of Weeds. 10	Consolidation. 20	Uniformity of Preparation. 20	Total. 100
C. Smith & Sons	Yarding ...	35	9	9	19	19	91
E. M. K. & C. Allen	Central Kumminin	36	8	8	19	18	89
F. C. Farrall & Son	Yarding ...	32	9	10	18	19	88
S. A. Brown ...	Bungulluping	32	9	9	18	19	87
R. Mann ...	South Shackleton	32	8	10	19	18	87
Buller & Black...	Bakakin ...	33	8	10	18	17	86
A. W. Wheeler ...	Babakin ...	33	8	9	18	18	86
H. H. Harling ...	Belka ...	25	9	10	19	19	82
W. D. Johnson ...	Bruce Rock	30	8	8	17	18	81
P. McCarthy & Son	Eujinyn ...	29	7	9	16	19	80

The winning fallow was that of Messrs. C. Smith and Sons, of Yarding, with 91 points. The land was chiefly salmon gum country with a few scattered gimlets. It was ploughed early in June with a mouldboard plough to a depth of 3 inches. The first cultivation was given with a Sundercut plough in August, followed by another working with a Springtyne cultivator in September. This entry was a nice even piece of fallow. The moisture content, which was surprisingly high considering the scanty spring and summer rains, was evenly distributed throughout the 50 acres. A good mulch of an even depth of 2 to 2½ inches covered a well consolidated, firm and level seed bed. Sheep had been run over the fallow, with the result that but very few weeds were present, only some small patches of wild oats being noticed. The preparation of this fallow had been carefully carried out, resulting in a very uniform entry.

Messrs. E. M. K. and C. Allen, of Central Kumminin, came second with 89 points to their credit. The land was heavy salmon and gimlet country. It was fallowed early in August with a mouldboard plough to a depth of 3 inches. It was harrowed in September and scarified with a Gersch scarifier at the beginning of October. This entry gained the distinction of having the highest moisture content of any fallow in the competition. The crabholey nature of the paddock somewhat spoilt the uniformity of and accounted for hard patches on which barley grass grew. The mulch was a little lumpy in places due to the stiff nature of the soil.

Third place was gained by Messrs. F. C. Farrall and Son, of Yarding, who scored 88 points. Their land was also salmon and gimlet country and was ploughed with a mouldboard about the middle of July to a depth of 3-4 inches. It was cultivated with a Springtyne early in September and was not touched again until the beginning of January, when it was harrowed after a shower of rain. It received another harrowing about the end of January, and a final working with the same implement during the middle of February. The moisture content of this fallow was not as high as the first two entries. A nice mulch had been prepared, although it was a little fine in places. A good, firm and consolidated seed bed had resulted from the cultivations given. This entry was free from weeds.

The following table summarises the cultural methods of all competitors—

TABLE OF CULTURAL METHODS.

Competitor.	C. Smith & Sons.	E. M., K. & C. Allen.	F. C. Farrall & Son.	S. A. Brown.	R. Mann.
Timber ...	Salmon and scattered Gimlet	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet
Ploughed ...	End of June	Early in August	Middle of July	End July, and beginning August	End of July
Type of Plough	Mouldboard	Mouldboard	Mouldboard	Mouldboard	Mouldboard
Depth ...	3 inches	3 inches	3–4 inches	3 inches	4 inches
Cultivations ...	Sundercut early in August. Cultivated with a springtooth in September	Harrowed in Sept. Scarified with a Gersch beginning of October	Cultivated with a springtooth early in September. Harrowed twice after rain in January and again beginning March	Sundercut in Sept. Cultivated with a springtooth beginning October and immediately after cross cultivated with same implement and again in middle of February	Scarified with a Gersch at end of August and again at and of September. Harrows dragged behind Gersch at last scarifying

Competitor.	Buller & Black.	A. W. Wheeler.	H. H. Harling.	W. D. Johnson.	P. McCarthy & Son.
Timber ...	Jam, Salmon, Gimlet, Mallee and White Gum	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet	Salmon Gum and odd Gimlet
Ploughed ...	July	End July, beginning August	End July, beginning August	Beginning September	Early in June
Type of Plough	Sundercut	Mouldboard	Half mouldboard and half Disc	Mouldboard	Disc
Depth ...	3–4 inches	3½–4 inches	4 inches	4 inches	4½–5 inches
Cultivations ...	Scarified with a May and Miller in September and October. Portion harrowed in September	Harrowed after ploughing. Scarified with a May and Miller end August and again beginning October. Light harrows dragged behind scarifier	Cultivated with a combine twice (crossed) in August and again in September	Cultivated with a springtooth in October, late in November and again at beginning of March	Sundercut in August. Cultivated with a combine in December after rain

An analysis of the data given in the above table yields some interesting information as to the methods of the competitors.

The mouldboard plough is easily the most popular type of plough, being used by no less than seven of the ten competitors. The Disc and Sundercut were used by one each, while one competitor used both a Disc and a Mouldboard.

Most of the fallowing was done in July, six of the ten competitors ploughing in that month. Two fallowed in June, one in August, and one in September.

Three inches was the popular depth of ploughing, six farmers ploughing to that depth. Three favoured 4 inches, while one competitor ploughed as deep as 5 inches. The trouble about deep ploughing is the greater difficulty, not only of ploughing deep over the shallow, but also in consolidating the seed bed and obtaining a shallow mulch. Especially in such a dry spring and summer as that just experienced, there has not been the opportunity to work the fallows down, and hence the deep ploughing has suffered.

The importance of placing a mulch on the fallows as soon after ploughing as possible, in order to conserve the soil moisture and kill the weeds before they have a chance to seed, is apparently fully realised, for five entries received the first cultivation in August, four in September, and only one as late as October. The average number of times the fallows were worked was three. Four received a second working in October, two in September, and one each in August, November, December, and January. Three only cultivated their fallows in the dry condition. This is not considered a wise practice, as there is a tendency to make the mulch too fine, and moreover there is a danger of spreading "Take-all."

As regards the cultivators used for the first cultivation, the sundercut was the most popular implement, being used by three competitors. The springtyne, scarifier and harrows were each used by two entrants and the combine by one. For the second cultivation, the scarifier was used by four, springtyne three, combine two, and harrows one. From what was seen on the fallows inspected the scarifier makes an excellent job, not only in obtaining a good mulch and destroying weed growth, but it also leaves a nice level seed bed.

The fact that seven of the competitors ran sheep contributed no doubt to the cleanliness of the fallows, which were, on the whole, very good in this respect.

Tractors divided the honours with the horses, five competitors using tractors, and five, horses.

The standard of the fallows generally was very high and made the work of judging very difficult. This competition will be watched by many farmers in the district, besides the competitors themselves, and the fact that in almost every case the fallows entered were a portion of the whole fallow of the farm, and not a specially prepared plot, considerably enhances the value of the competition.

DOODLAKINE-BAANDEE AGRICULTURAL SOCIETY.

The Doodlakine-Baandee Agricultural Society conducted two Fallow Competitions this year; one an open competition for the best 50-acre plot of fallow for which a trophy valued at £5 5s. had been donated by J. W. Spillman, Esq., and the other a competition for a plot of fallow of the same area eligible for Agricultural Bank, Soldier Settlers and Industries Assistance Board clients only, and for which a trophy valued at £4 4s. had been presented by G. P. S. Jenning, Esq. There were 13 entries for the open competition and three for the other.

The scale of points under which both competitions were judged was as follows:—

	Points.
Moisture	40
Mulch	10
Absence of Weeds	10
Consolidation	20
Uniformity of preparation ..	20
Total . ..	100

Judging was carried out on February 14th and 15th. The following table shows the rainfall recorded at Doodlakine and Baandee from June until January, inclusive.

Place.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Total.
Doodlakine ...	176	141	101	130	61	29	70	24	732
Baandee ...	178	134	90	138	49	32	44	9	674

The summer rains were very light this season, with the result that, apart from the spring cultivations carried out after fallowing, most of the fallows have received no further cultivations, for the competitors find that it does not pay to cultivate the fallows except after rains.

THE OPEN COMPETITION.

The following table shows the points gained by the various competitors:—

DOODLAKINE-BAANDEE AGRICULTURAL SOCIETY FALLOW COMPETITION.

Open for J. W. Spillman, Esq., Trophy.

No.	Competitor.	Moisture. 40	Mulch. 10	Absence of Weeds. 10	Consolidation. 20	Uniformity of preparation. 20	Total. 100
1	F. Birch	34	9	10	19	19	91
2	Barton & Sons ...	35	8	9	18	19	89
3	W. F. Noack	34	9	8	17	19	87
4	W. S. George (1) ...	33	8	9	18	18	86
5	W. S. George (2) ...	32	7	10	17	17	84
6	Prowse Bros.	30	7	7	18	17	79
7	J. H. Mutter	26	8	10	18	17	79
8	H. Birch	26	7	9	19	17	78
9	O. R. Saunders ...	25	7	9	16	16	73
10	A. E. C. Prowse ...	23	8	4	17	18	70
11	R. Barnes	23	6	10	15	16	70
12	J. W. Spillman ...	20	7	9	17	15	69
13	A. E. Noack	19	5	9	15	16	64

The winning entry, that of Mr. F. Birch, of South Bandee, was on heavy salmon and gimlet country. It had been well ploughed to an even depth of 3½ inches with a disc plough early in July. A mouldboard plough was then used to cross plough it about the end of the month. It was springtooth cultivated in September, harrowed after rain in October, and rolled to break the clods down in February. This entry was a very attractive piece of fallow. The moisture content was high and the seed bed was covered with a nice even mulch which was, however, a little deep in places. There was an entire absence of weeds, the consolidation was very good, and the preparation very uniform.

Messrs. Barton and Sons, of North Baandee, gained second place with 89 points. Their land was not quite so heavy as the winning entry. It was disc-ploughed to a depth of 3-4 inches in the middle of June, cultivated after ploughing, again during September, and during the first week in February with a Gersch scarifier. The moisture content of this fallow was slightly better than the winning entry but a point was lost for the presence of weeds, the so-called "Summer Thistle" or "Potato Weed" (*Solanum hoplopetalum*). The mulch was a little too fine, due probably to working in the dry state. The working of the land had been very uniformly carried out.

Third place was gained by Mr. W. F. Noack, of Baandee, with 87 points. This entry, which was on salmon gum and morrel land, had been dry-ploughed in February, 1927, with a skim plough to a depth of 3 inches and received five cultivations; the first was with a springtooth in June. It was then disced and harrowed in July and springtoothed again in October, and finally one in December to destroy the weeds. The moisture content was good, the mulch very even and in good tilth. A few points were lost for the presence of barley grass which had gone to seed, and the "Summer Thistle" or "Potato Weed" (*Solanum hoplopetalum*). The consolidation was not so good, the seed bed being a little loose.

The following table shows the cultural methods employed by the competitors:—

CULTURAL DETAILS.—OPEN COMPETITION.

Competitor.	F. Birch.	Barton & Sons.	W. F. Noack.	W. S. George. (1.)	W. S. George. (2.)
Timber ...	Salmon and Gimlet	Salmon and Gimlet	Salmon and Morrel	Salmon, Gimlet and Mallee	Salmon, Gimlet, Mallee and Tea-tree
Ploughed ...	July	Middle June	February	June	July
Type of Plough	Disc	Disc	Skim Plough	Mouldboard	Mouldboard
Depth	3½ inches	3–4 inches	3 inches	3½ inches	3½ inches
Cultivations ...	Cross ploughed with mouldboard in July. Springtooth cultivated in September. Harrowed in October and rolled first week in February	Cultivated after ploughing, again in middle of September, and during first week in February with Gersch scarifier	Cultivated with springtooth in June. Disced and harrowed in July Springtoothed in October and December	Cultivated with Sundercut in July; springtooth in August. Harrowed first week in September	Springtooth cultivated in August. Harrowed in September
Competitor.	**Prowse Bros.**	**J. H. Mutter.**	**H. Birch.**	**G. R. Saunders.**	**A. E. Prowse.**
Timber ...	Salmon and Gimlet	Salmon, Gimlet and Mallee	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet
Ploughed ...	July	July	July	July	June
Type of Plough	Mouldboard	Mostly Mouldboard, balance Disc	Mouldboard	Mouldboard	Mouldboard
Depth	3–4 inches	3½ inches	3 inches	3–4 inches	3–4 inches
Cultivations ...	Springtooth cultvated after ploughing in August. Harrowed in October and December	Harrowed in middle August, Disc cultivated end August. Harrowed in October	Skim ploughed beginning August, Springtooth cultivated end August	Springtooth cultivated in September and October. Disced end November	Disc cultivated in September Harrowed soon after
Competitor ...	**F. Barnes.**	**J. W. Spillman.**	**A. E. Noack.**		
Timber ...	Salmon, Gimlet and Mallee	Salmon and Gimlet	Morrell		
Ploughed ...	Early July	July	Early June		
Type of Plough	Mouldboard	Sundercut	Mouldboard		
Depth	2–4 inches	4 inches	4 inches		
Cultivations ...	Cultivated with a shearer duckfoot in August and with Springtooth end of September	Disc cultivated in August. Springtooth cultivated in October	Cross disced early in August and again in September		

The chief fault of the competitors was that the mulch was, in most cases, too deep. This, however, may be due to some extent to the absence of summer rains which would tend to consolidate it. The only weeds noticed were Barley Grass and "Summer Thistle" (*Solanum hoplopetalum*). The former is a bad weed in respect of its being a host or carry-over plant for Take-all. The latter weed not only looks bad on the fallow, but, where it is at all thick, robs the soil of a considerable amount of moisture, more so that is generally accepted, as was demonstrated on several occasions whilst judging.

DOODLAKINE-BAANDEE AGRICULTURAL SOCIETY.

Competition for Agricultural Bank, Soldier Settlers and I.A.B. Clients.

There were only three entries in this competition, all of whom were competitors in the Open Competition.

The points awarded are as follows:—

Competitor.	Moisture. 40	Mulch. 10	Absence of Weeds. 10	Consolidation. 20	Uniformity of Preparation. 20	Total. 100
Barton & Sons	38	9	8	18	19	92
F. Birch	34	9	10	19	19	91
J. W. Spillman	20	7	9	17	16	69

The winning entry, that of Messrs. Barton and Sons, was in another paddock to that of their entry in the Open Competition. The soil was of a similar nature and the fallowing was done in June with a disc plough to a depth of 3 inches. It was cross-ploughed with a disc in July, scarified in the middle of September, and again during the first week in February, after which it was harrowed. The moisture contents of this fallow was very good indeed, and was quite the best of any fallows inspected in either competitions. The mulch was better, not being so fine. There were a few more weeds in evidence.

Mr. F. Birch, who gained second place with 91 points, had a plot of 50 acres in the same paddock and alongside his entry in the Open Competition, and the whole paddock received the same treatment as that outlined in the other competition. Mr. J. W. Spillman gained 69 points for his entry which was a good deal below the standard of the others. The land was salmon and gimlet country and was ploughed to a depth of 4 inches with a sundercut in July. It was turned back with a disc in August and given a springtooth cultivation in October. The moisture content was very low. The mulch was too deep in places and had set down in others. Barley Grass, Wild Oats, and "Summer Thistle" were in evidence. Hard patches which had not been ploughed were also noticed.

The following table shows the cultural methods employed by the competitors:—

Name ...	Barton & Sons	F. Birch	J. W. Spillman
Timber	Salmon and Gimlet	Salmon and Gimlet	Salmon and Gimlet
Ploughed ...	June	July	July
Make of Plough	Disc	Disc	Sundercut
Depth	3 to 4 inches	3½ inches	4 inches
Cultivations ...	Cross ploughed in July; scarified in Sept., again in Feb. and harrowed	Cross ploughed with a mouldboard in July; springtoothed in Sept.; harrowed in Oct., and rolled in Feb.	Disced in August and springtoothed in Oct.

POTATO CHIPS.

G. N. LOWE,

Senior Potato Inspector.

Prolific Crops in the Young's Siding Area.

Despite the excessively dry summer, wonderful returns have been obtained from the peat swamps adjacent to Lake Saide, in the Young's Siding district.

Growers in the locality certainly were due for such a harvest after last season's disastrous floods, when after 7½ inches of rain in two days, practically the whole of their crops were lost through flooding.

This was certainly in the nature of a disaster to the growers, and may also be regarded similarly from a State standpoint, as undoubtedly the greater proportion of those crops would have been available as Government certified seed to be planted in other districts, particularly in the South-West where generally the need of thoroughly reliable and highly productive seed is so urgent.

The following illustrations give an idea of yields of portions of the crops harvested in the Young's Siding area.

Portion of T. H. Tonkins' crop which yielded at the rate of 21 tons per acre.

The demand for Government certified seed from this locality has been remarkable, as in less than three weeks from the time of digging, practically all available (about 200 tons) was sold for use in the South-West.

This is the more remarkable in that South-Western growers do not ordinarily commence to think about seed supplies until two months later under ordinary conditions.

Illustrating what a 21-ton crop looks like when bagged.

Fortunately, for the later comers, supplies of the same strain grown in the Capel and Donnybrook districts are, at the time of writing, available, but indications are that soon even these stocks will be exhausted.

It may be safely stated, that the only really good crops in the South-West districts, taking Bunbury as a centre, are from Government certified seed or its near progeny. Despite the exceptionally dry summer this type of seed stands right out from the local strain, which is now heavily infected with Mosaic and Leaf Roll.

Fallowing in Benger Swamp.

The value of fallowing in Benger has been demonstrated most markedly this season.

Despite the fact that the land ploughed up for this purpose has only the period from February to June before going under water, the benefit to the subsequent crop is most clearly noticeable. One grower this season, with the idea of returning humus to the soil, sowed oats on a portion of his land as a trial, and he is undoubtedly on the right lines, as continuous cropping has certainly reduced this important constituent of the soil to a very low point. It is probable that a luxuriant quick growing crop such as maize ploughed under, when about one-third grown, would be of greater service in this direction as providing a greater wealth of green stuff.

Provision would, of course, have to be made for rolling the young growth down prior to turning under and thickly sowing to prevent the plants becoming too rank in growth.

Portion of A. E. Martin's crop, which yielded at the rate of 19½ tons per acre.

A Hot Formalin Dip.

A considerable saving in time in dipping of seed potatoes, which should be a regular operation, can be effected by taking two pints of formalin and adding to 30 gallons of water heated to 120° Fahrenheit. A reliable thermometer is necessary, of course, to check the temperature.

Whole or part bags of seed may be handled according to the type of receptacle used and the potatoes immersed in the solution for two minutes only, as against 1½ to 2 hours in the case of the *cold* formalin dip hitherto largely used. Allow the tubers to remain in the bag for an hour after removal from the tank and turn out to dry.

A supply of the stock solution, both hot and cold, should be at hand in order to more readily keep the correct temperature in the dipping tank.

Not only is the hot dip claimed to be more effective, but the saving of time where a quantity of seed has to be treated is very apparent.

It is moreover perfectly safe from the danger of possible poisoning, which is liable to occur when corrosive sublimate is used.

Benger Swamp Experiment.

It is regrettable that this experiment has turned out a failure, owing to wholesale lack of germination of the seed.

It was decided in order to save the delay necessary where the seed cut into wet bags on the site of the experiment, to prepare it at this office two days before and rail it down ready for an immediate start on arrival. Unfortunately the seed did not come to hand for five days during which the hottest weather of the season was experienced.

Superficially, at least, on examination, when it did finally reach the swamp, the seed appeared in good order, but failed later to germinate except in very meagre fashion, so as to render the experiment quite useless from a comparative standpoint.

One fact, however, is very clearly demonstrated, namely, that "wet bagged" seed must not be held longer than the specified time, that is from 24 to 48 hours in the summer.

If growers are warned by this experience, then the lesson from the experiment will not have been altogether lost.

It is interesting to note, moreover, in the case of seed which had been grown in the Burekup experiment with the inclusion of potash in the fertiliser, that the germination, despite the above accident, was more than double that of seed grown without potash.

It has long been the opinion of the writer that to the use of fertiliser containing no potash, may be ascribed the decrease in value from a seed standpoint of tubers so treated.

Repeated analyses disclose in experiments when "Delawares" are grown with potash, that the starch content is increased over three per cent.

The cook certainly values this extra starch in the tuber, and it would appear reasonable that the plant resulting will do likewise. Certain is it, that the plant, whether it be a potato or any other, is not going to thrive properly if the seed it springs from be deficient of a full supply of plant food.

The Planting Machine in Benger.

An improved type of planting machine has been used successfully in Benger Swamp this summer.

The improved planting machine used in Benger for the first time this summer.

The method followed, however, is to allow the machine to drop the seed and fertiliser in the furrow after a three-furrow plough, as illustrated.

Under this system there is a tendency for the seed to roll, and so cause loss by being squashed under the hoofs of the furrow horse.

The machine is designed to plant well cultivated mellow soil as a complete unit, but even as used in Benger, effects a considerable saving in the wages sheet.

Covering the seed and fertiliser with the three-furrow plow after the planting machine.

With a leader to share the heavy draft occasioned in Benger, a preferable method seemingly would be to use the machine to plant the freshly-ploughed land, and so obviate squashed seed.

The Difference in Strains of "Delaware."

The accompanying illustration depicts very clearly, once again, what loss and trouble may occur in a crop where poor seed is used.

Mr. Fred Mitchell, of Young's Siding (where, incidentally, the best seed in the State comes from), decided after seeing an advertisement, to order from a grower in another district which once had the name of providing reliable seed.

He ordered quite largely (to his subsequent sorrow), and when the consignment came to hand the tubers appeared desirable seed.

In the words of an advertisement, "Every picture tells a story," and this one shows, on either side a crop which later yielded 12 tons per acre, grown from his own seed, whilst the centre planted from the bought strain depicts only a few unhappy plants, which did not return anything like the weight per acre of seed planted.

The difference between good seed and merely *good looking* seed. Twelve tons per acre on either side and a complete failure in the centre.

Mr. Mitchell is a young grower, and as about two-thirds of his area was sown with the bought seed the results were most disheartening to him, and naturally occasioned a heavy loss.

What prospective buyers of Government certified seed should look for.

With all the publicity given this type of potato seed, both in this Journal and the public press, it is remarkable that there are still numerous buyers who do not know how to definitely identify the genuine from the spurious article.

The enviable reputation of Government certified seed has naturally enough given rise to imitation, which even if the sincerest form of flattery, is not productive of high potato yields.

Instances are continually noticed where speciously worded advertisements, of what is purported to be seed bearing the certificate and seal of this Branch, are catching the unwary buyer.

To again emphasise what the buyer must look for in order to be quite sure as to what identifies Government certified seed:—

1. The bag must be new, and bears the name and address of the grower in 2½in. stencilled letters.

2. The bag is double sewn, and on to the ends of the twine is attached with a leaden seal the certificate which has set out on it the name and address of the grower. the variety and grade, the inspector's name, and date of last inspection.

FARMERS' FIELD TRIALS.

H. RUDALL,
Field Officer.

The Farmers' Field Trials carried out during the 1927 season were variety trials and rate of seeding experiments with wheat.

The wheat variety trials were conducted at Bencubbin, Welbungin, Lake Brown, East Goomarin, Southern Cross, and Carnamah. Except in the trials at Carnamah where the area of each plot was 0.4 acre, all the plots were each half an acre in area. At all centres each trial was planted in duplicate.

In the wheat variety trials comparisons were made with S.H.J. and Noongaar with the control variety Gluyas Early. At Carnamah comparisons were made with Nabawa and Yandilla King, using Bena as control.

The rate of seeding trials were carried out with the very early variety Noongar. At Carnamah with the midseason variety Nabawa.

Field days (attended by the Director of Agriculture, Mr. G. L. Sutton) were held at each of the centres in the Eastern Wheat Belt, and great interest was evinced by those farmers present.

The details of the cultivation of the plots at the different centres are.—

CULTURAL NOTES.

Lake Brown (J. Mulqueeny)—Variety Trial and Rate of Seeding Trial.—The land was ploughed in June, 1926, 4 inches deep, ploughed back in September 2 inches deep, harrowed in December, 1926, after rain. Twice harrowed during March 1927. Cultivated with a springtyne cultivator at the beginning of May and prior to seeding. Sown 30th May. Variety trial 45 lbs. seed and 70 lbs. super. Rate of seeding trial, 70 lbs. super per acre.

Welbungin (W. Bagshaw)—Variety Trial and Rate of Seeding Trial.—The land was ploughed in September, 1926; lightly cultivated with springtyne cultivator in September and October, 1926, also in March, 1927. Tandem disced with harrows in May; sown 25th May. Variety trial, 45 lbs. seed, 75 lbs. superphosphate. Rate of seeding, 75 lbs. superphosphate per acre.

Southern Cross (E. H. Richards)—Variety Trial, Rate of Seeding.—The land was ploughed in June and July, 1926, to a depth of 3 inches. Cultivated with a springtyne cultivator in August and November, 1926, and again at the beginning of April, 1927, after heavy rain in March, and part harrowed prior to seeding. Sown 19th and 20th May. Variety trial 45 to 50 lbs. seed, 75 to 80 lbs. superphosphate. Rate of seeding 75 to 80 lbs. superphosphate.

East Goomarin (E. Randolph)—Variety Trial and Rate of Seeding Trial.—The land was ploughed in July, 1926, about 3 to 3½ inches deep, and again at the end of August owing to the quantity of self sown. Cultivated with a springtyne cultivator in October, 1926, and again in April, 1927, after the heavy March rains, and harrowed in May just prior to seeding. Sown 24th May, variety trial 45 to 50 lbs.; superphosphate 75 to 80 lbs. Rate of seeding 75 to 80 lbs. superphosphate per acre.

Carnamah (J. K. Forrester).—The land was ploughed in July, 1926. Cultivated with a disc implement in September and with a springtyne cultivator in October, 1926; again with the same implement in April, 1927. Sown 27th and 28th April. Variety trial 50 lbs.; superphosphate 100 lbs. Seeding trial 100 lbs. superphosphate per acre.

RAINFALL AT VARIOUS CENTRES, 1927.

Centre.	Jan.	Feb.	Mar.	April.	Growing Period.						Total. May-Oct.
					May.	June.	July.	Aug.	Sept.	Oct.	
Lake Brown ..	..	...	518	72	34	149	202	78	178	23	664
Welbungin ...	..	9	462	27	110	277	190	50	197	25	849
Southern Cross ..	13	26	560	40	102	145	183	61	491	96	1,078
East Goomarin ..	31		501	49	47	180	233	73	197	44	774
Bencubbin .		.	603	81	58	243	234	123	178	58	894
Carnamah ..		..	371	47	115	362	337	221	142	21	1,198

THE SEASON.

The abnormal rains in March were general throughout the State, and in excess of those which fell during the corresponding month of the previous year (1926).

The resulting weed growth necessitated various cultivations during April and that portion of May prior to seeding. As a result of the high moisture content and these subsequent cultivations, the soil was in a good condition to receive the seed, and consequently the warm conditions of May complemented in producing a good and immediate germination.

The copious rains and frosts of June and July effectively checked a too vigorous plant growth, and assisted in the stooling of the wheat plants and the development of good root systems. What may be termed a dry spell occurred towards the latter end of August and the beginning of September. The resulting anxiety was alleviated by the knowledge, in many cases, of the security based on well-prepared fallow. On such land the crops maintained their colour and growth until timely rains, about the middle of September, relieved the situation. These rains continued throughout of the remainder of the month and into October, and, together with the warm weather during this latter month, provided ideal conditions for the maturing of the various varieties and the production of well-developed and full grains, particularly with the early wheat varieties.

The results obtained with the different trials are shown hereunder:—

VARIETY TRIALS.

Varieties.	Computed Yield per acre per plot.				
	J. Mulqueeny, Lake Brown.	W. Bagshaw, Welbungin.	E. H. Richards, Southern Cross.	E. Randolph, East Goomarin.	B. W. G. Hopwood, Bencubbin.
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.
S.H.J.	13 10	23 0	23 18	14 46	14 46
Gluyas Early ...	16 2	24 0	31 54	18 6	15 4
Noongaar	12 28	23 0	25 52	14 30	13 32
S.H.J.	11 26	24 0	23 8	14 40	13 18
Gluyas Early ...	15 22	26 0	31 2	17 34	14 42
Noongaar	12 48	23 0	22 42	15 26	14 36

RATE OF SEEDING TRIAL—VARIETY NOONGAAR.

Rate of Seed.	Computed Yield per acre per plot—				
	J. Mulqueeny, Lake Brown.	W. Bagshaw, Welbungin.	E. H. Richards, Southern Cross.	E. Randolph, East Goomarin.	B. W. G. Hopwood, Bencubbin
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.
30	16 16	21 0	24 24	14 24	12 38
45	16 4	23 0	24 18	14 58	12 46
60	16 4	24 0	22 22	15 32	*
30	12 24	21 0	25 2	13 34	13 44
45	13 24	24 0	28 20	14 44	13 50
60 .. .	14 34	25 0	21 32	15 12	13 56

* Owing to an accident with this plot the results were affected to such an extent that no comparison can be made,

VARIETY TRIAL.

Area: 4 acres.

J. H. Forrester, Carnamah.

Variety.	Yield per Plot.	Computed Yield per acre per Plot.
	bus. lbs.	bus. lbs.
Yandilla King ...	8 41	21 42
Bena (Control) ...	11 43	29 17
Nabawa	10 34	26 25
Yandilla King ...	8 9	20 22
Bena (Control) ...	11 55	29 47
Nabawa	9 29	23 42

Yandilla King and Bena were both badly affected by rust on the stalk.

RATE OF SEEDING TRIAL.

Variety Nabawa—Area: 4 acres.

J. H. Forrester, Carnamah.

Rate of Seed.	Yield per Plot.	Computed Yield per acre per Plot.
	bus. lbs.	bus. lbs.
60 lbs. ...	9 44	24 20
45 " ...	10 3	25 7
90 " ...	9 58	24 55
60 " ...	11 18	28 15
45 " ...	10 33	26 22
90 " ...	11 0	27 30

BEE-KEEPING NOTES.

H. WILLOUGHBY LANCE,
Apiculturist.

This is the time of year when bee-keepers should be busy preparing for the swarming season and the time of increase.

Experienced bee-keepers are prophesying a good season. Jarrah is showing up well, and given the right climatic conditions, should yield a good surplus. Although the Marri (red gum) gave a good surplus in most districts in the past season, there is likelihood of this showing up well again next summer. Some districts, especially the coastal ones, can nearly always rely on a good average honey flow, but unfortunately the quality of honey is not usually of the best. The Taylorina honey from Albany district is an exception, this being a light clear honey of a somewhat peculiar flavour, and might be described as of the Fancy grade.

Coastal bee-keepers in most cases would be well advised to look out for a site where there is a probability of a honey flow from the Marri or Wandoo, and move their hives to the location when the flow starts. The home apiary, producing plenty of honey and pollen in the spring, will enable the bees to build up strong, then the hives can be moved to the district where the better class of honey is obtainable

In the preparation for the ensuing season, the overhauling of all unused hives and frames should be the first consideration, and no time should be lost in putting these in order, as in some districts with an early season the bees prepare for swarming in August.

The inside of body boxes and floors should be cleaned of propolis etc.; outside cracks stopped with putty; the edges of boxes where they rest on one another, or the floor board, planed up if necessary, so that the joints are a good fit, and no places for the smell of fresh honey in the hive to issue, and tempt robbers to try to get in and help themselves to the other fellow's sweets, instead of foraging for themselves.

The roof should be sound and a good fit. The complete hive should then be given one or two coats of good paint as may be required. The cost of paint is easily saved in many extra years of life of the hive, which should be painted at least every two years.

As soon as the weather is warm enough, all the colonies in the apiary should be gone through and faulty and old hives changed for those which have just been overhauled. These faulty hives should be put in order at once and can then be used to replace others that require attention, or kept for any increase.

Home-made Hives.—For the benefit of those who cannot afford to buy factory-made hives, particulars are here given of a hive made from petrol cases, which, if carefully made, will stand almost as well as factory-made ones.

The standard sizes of factory hives are 8 and 10-frame. The petrol case will make a good 9-frame hive.

The inside width of an 8-frame hive is 12⅛ inches; that of a 10 frame 14¼. A petrol case will make a hive 13¾. Standard frames are 1⅜ inches wide; 10 of these would equal 13¾ and be a tight fit, and be very difficult to manipulate. These hives therefore should only be used for 9 frames. In the supers these frames can be spaced out equally and should produce good fat combs easy to uncap. But in the brood chamber, they should be placed close together and a dummy board, say of ⅞-inch wood, inserted to take up the extra space. The reason for this is that the natural spacing of brood combs is 1⅜in. Drone brood requires a larger space, and if combs are further apart, the bees have greater facilities and inducements to build drone comb.

Figure 1 is a photograph of the complete hive shown with the body drawn back a little and the roof at the side. The floor is made of the sides of a petrol case ½in. thick. but if thicker wood is obtainable, so much the better. These are cut 15¾in. long, nailed to two pieces of 3 x 1 jarrah, sloped off at front to allow of a good alighting board for the bees. The length of the level portion should be at least 23in. On this surface along the back of the two sides, nail strips of wood 1in. x ⅜in for the body to rest on. This will raise it above the floor and allow an entrance all along the front.

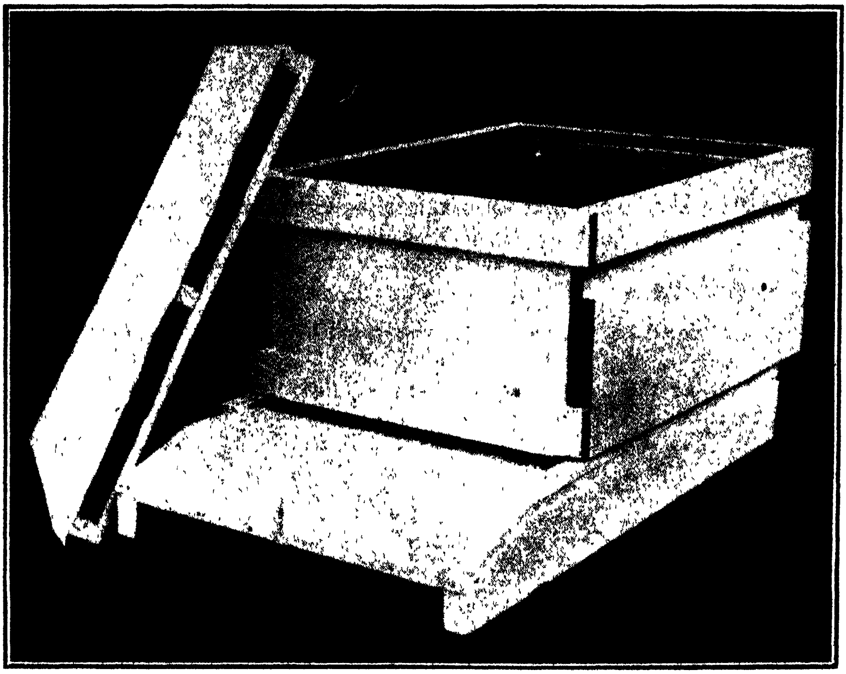
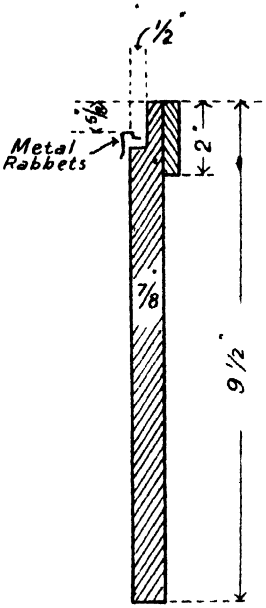


Fig. 1.

For the body, use the two ends of the case, the top edge being rabbeted as shown in Fig. 2 and metal rabbets nailed on. These can be obtained from any dealer in bee goods. The object of the rabbets being to allow of bees running under the ends of the frames, and also giving less surface for the bees to stick tight with propolis.

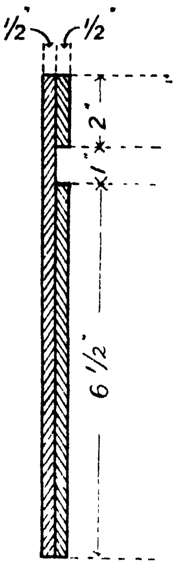


Section through AB

FIG. 2

The sides of the case are next cut to 20⅛in. long and nailed on to the two ends. The ends are now ⅞in. thick and the sides ½in.; ½in., however, is thin for the sides and does not conserve the heat of the hive as well as ⅞in.; therefore nail another thickness of ½in. wood outside this, but not the whole depth of side. The top strip may be 2in. wide. Then leave a 1in. gap; the bottom strip will then be 6½in. wide. Now nail along the top and bottom of front and back two more 2in. strips. These will strengthen the joints and the strips along the top will give a good hold all round for lifting the body. To make the method of putting the hive together more plain, the ends of the wood in Fig. 1 are shown dark. Figure 2 shows a section through the ends and Fig. 3 through the sides. Figure 4 is a plan.

The roof can be made of ½in. wood from petrol cases, or if available thicker wood for preference. The side of a petrol case is the exact length required. Now prepare three strips of 1in. seasoned jarrah or good white wood, one inch, one and a quarter inches, and one and a half inches wide respectively. These form the cross-pieces to which the roof is nailed, the one and a half inch piece in front and the one inch piece at back, thus giving a slight slope to run the water off.



Section through CD

FIG. 3

The piece of galvanised iron 24½in. × 19in. is now obtained, the corners cut and the front and back bent over and nailed to the cover. The sides are bent at an angle of about 45deg. but not nailed. This will allow ventilation between the wood top and the iron roof, and will at the same time prevent the rain driving under. Should spiders make their web in this space, it is an easy matter to bend the sides up and clean out the web with a stick. In Fig. 1 the visible side is shown bent up for cleaning.

If galvanised iron is not available, a petrol tin may be used. Cut the ends out; cut the remainder down at two opposite corners, so that you have two pieces each composed of two sides of the tin.

These may now be used for the roof, one overlapping the other; the joint being nailed down along the centre cross-piece.

The whole should now be painted with two coats of white paint, but if tar is available it is preferable to dip in or paint the floor board with hot tar. The iron roof may be painted with red oxide if desired.

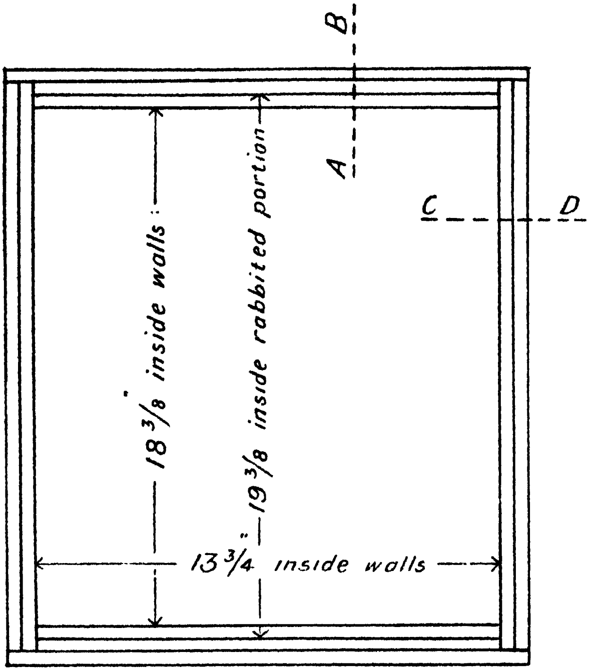


FIG. 4

Frames.—It does not usually pay to make these, as they must be made very exact and of good wood. The pattern most generally favoured is the Victorian pattern with wedge only. These must be nailed firmly and rigidly and well wired. The simplest method being with four parallel wires as in Fig. 5.

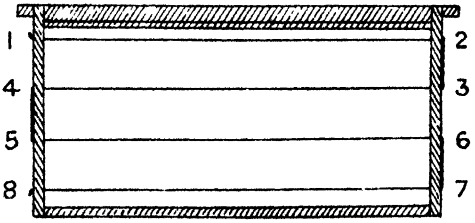


FIG. 5

Full sheets of foundation should be used, and threaded between the wires so that each alternate wire is on opposite sides of the foundation. The foundation is now pressed home into the top of the frame, the wedge inserted, and pressed hard against the foundation and secured with three or four nails. The frame and foundation is now placed on a piece of wood cut to fit inside the frame and placed on the table, the foundation and wires resting on it. Now warm the wheel embedder in a flame, and run briskly along the wire. This will slightly melt the wax and cause it to adhere to the wire. The frame is now ready for use

The nails required for the work are as follows:—

1¾ x No. 14 cement coated for nailing the sides to the ends, and the 2in. top and bottom strips; floor boards to the 3 x 1 jarrah; and the wood cover to the cross-pieces. (If, however, screws are available it will be better to use them for this work.)

1in. x No. 14 galvanised (as used for asbestos cement sheets) for nailing the centre portions of the 2in. strips, and the extra pieces 6½in. x 20⅛in. x ½in. at the sides.

⅝in. clouts for the iron roof.

½in. x No. 10 for metal rabbets, also for the wedges of frames.

1in. x No. 18 for nailing frames.

With this type of hive the body box can be used either as a brood chamber or as a super, as there is no piece cut out for entrance, the entrance being given by the strips nailed to the floorboard. The bottoms of the frames hanging flush with the bottom of the body, will give a ⅜in. bee space. The rabbeting at the top also allows a bee space between the top of the frames and the cover, or the frames of the super, as the case may be.

It should always be remembered that a natural bee space is 5/16in. and should never be less than ¼in. or the bees will stop it with propolis; if more than ⅜in. the bees will very likely build comb therein.

FIELD EXPERIMENTS WITH WHEAT AND OATS AT THE WONGAN HILLS LIGHT LANDS FARM.

I. THOMAS,
Superintendent Wheat Farms.

A. R. VENTON,
Farm Manager.

In addition to the experiments already published in the March (1928) issue of the Journal of Agriculture the following experiments were conducted at the Wongan Hills Light Lands Farm during 1927—

WITH OATS.

Oat Variety Trial.

WITH WHEAT—

Seasonal Planting Experiment.

The monthly rainfall as officially recorded during the year, together with the averages for the past fifteen years, is hereunder—

Year.	Jan.	Feb	Mar.	Apl.	Growing Period.							Nov.	Dec.	Total for year.
					May.	June.	July	Aug.	Sept.	Oct.	Total.			
1927	...	7	301	34	143	221	260	89	57	50	820	5	11	1,178
Average 15 years ...	47	51	101	67	195	300	272	198	133	92	1,190	38	50	1,534

The rainfall of 8.20 inches for the growing period is generally considered favourable for this (light land) class of country. However, while the first half of the growing period (May-July) was very favourable, 6.24 inches being recorded against an average of 7.67 inches, the latter half was unfavourable. During this period (August-October) only 1.96 inches were recorded against an average of 4.23 inches. This amount fell on 32 different days and was usually followed by drying winds; consequently the crops did not get the full benefit and did not yield so well as was first expected.

The soil on which the experiments were conducted was mainly the smokebush type of country. This land was cropped once previously (1925-1926.)

OAT VARIETY TRIAL.

For this experiment the land was ploughed with the Sundercut plow during July, 1926; it was cross-ploughed during September to a depth of 2 inches with the same implement. At the initial ploughing heavy stubble from the previous crop was ploughed into the soil. Early in May, 1927, the land was Springtyne cultivated, this operation being repeated immediately prior to drilling, resulting in a good even tilth.

Seven varieties were used, and the early variety "Burt's Early" was used as the control. The plots were repeated eight times, five sections being harvested for grain and three for hay. The seed was planted at the rate of 40 lbs. per acre, and superphosphate was applied at the rate of 112 lbs. per acre The plots were planted on the 10th May.

The results obtained are set out in the table hereunder—

OAT VARIETY TRIAL.

HAY YIELD.

Planted 10th May, 1927. Seed, 40lbs. per acre. Superphosphate. 112lbs. per acre.

Variety.	Maturity.	Computed Yield per Acre.									Average Yield per Acre.			Average Yield, 1926–27.			Percentage Yield 1926–27.
		Section 1.			Section 2.			Section 3.									
		C.	Q.	L.	C.	Q.	L.	C.	Q.	L.	C.	Q.	L.	C.	Q.	L.	%
Mulga	Early ...	23	3	4	24	1	20	27	3	4	25	1	9	24	3	6	115
Burt's Early ..	Early ...	24	0	16	25	0	8	20	0	0	23	0	8	21	2	6	100
Ruakura ...	Late mid-season	15	2	2	19	3	4	18	2	0	17	3	21	16	0	3	74
Algerian ...	Late.	20	1	12	27	2	8	20	0	8	22	2	19	19	0	0	82
Burt's Early . .	Early ...	25	0	0	28	1	4	25	0	16	26	0	16	23	0	10	100
Glen Innes No. 7	Early ...	24	3	20	27	0	16	26	0	0	26	0	3	23	3	11	103
Guyra	Midseason ...	26	1	20	23	1	4	21	1	4	23	2	19	20	1	0	93
Burt's Early . .	Early .	24	3	12	25	1	6	19	2	16	23	1	2	21	2	17	100
Lachlan ...	Midseason ...	23	0	16	23	2	8	19	3	20	22	0	24	21	3	19	101

OAT VARIETY TRIAL.

GRAIN YIELD.

Planted 10th May, 1927. Seed, 40lbs. per acre. Superphosphate, 112lbs. per acre.

Variety.	Maturity.	Computed Yield per Acre.										Average Yield per Acre.		Average Yield, 1926-27.		Percentage Yield, 1926-27.
		Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.						
		bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	%
Mulga ...	Early ...	15	24	14	32	18	8	15	24	16	0	16	2	12	29	93
Burt's Early...	Early . .	13	32	17	0	18	0	18	24	17	32	17	2	13	24	100
Ruakura ...	Late mid-season	12	8	13	32	18	0	14	32	16	16	15	2	10	25	78
Algerian ...	Late ...	8	32	12	0	16	0	15	0	13	24	13	3	14	9	123
Burt's Early...	Early . .	10	32	*		13	24	14	0	13	32	13	2	11	24	100
Glen Innes No. 7	Early . .	7	16	11	32	11	8	12	16	11	8	10	32	12	16	107
Guyra ...	Midseason	9	8	12	24	13	8	11	24	10	24	11	18	13	13	106
Burt's Early...	Early ...	10	0	16	16	15	32	17	0	15	32	15	0	12	23	100
Lachlan ...	Midseason	‡		‡		‡		†		†		‡		‡		‡

* Owing to an accident when harvesting, the result of this plot is such that no comparison can be made. ‡ Shedding in these plots affected the yields of this variety to such an extent that the results cannot be used for comparison.

These average results indicate that, under the conditions of climate and soil at the Wongan Hills Farm, the early varieties of oats are better suited for hay than the midseason and late varieties, which in their turn appear to be the highest grain yielders.

SEASONAL PLANTING EXPERIMENT.

The land for this experiment was ploughed with the Sundercut disc plough early in July, and again at the latter end of August to turn in heavy stubble left after the first ploughing. At the end of September the land was skim ploughed to a depth of 2 inches with the same implement. During April it was cultivated with Springtyne cultivator, this operation being repeated immediately prior to seeding.

The seed was planted at the rate of 45 lbs. per acre, and superphosphate was applied at the rate of 112 lbs. per acre.

The plantings were made, *i.e.*, April, May, and June. All the plots, each one-eighth of an acre in area, were arranged in sections which were repeated to make each planting comprise five sections, each with a number of control plots of "Nabawa" planted in May. The objects of the various plantings are as follow—

April.

(a) To determine whether any other variety when planted in April is more prolific than the principal variety "Nabawa" planted in May.

(b) To determine the variety most suitable for planting in April.

May.

To determine the variety whether Late, Midseason, or Early most suitable for the principal planting in May.

June.

(a) To determine whether any other variety when planted in June is more prolific than the principal variety "Nabawa" planted in May.

(b) To determine the variety most suitable for planting in June.

APRIL PLANTING.

Seed—45lbs. per acre. Superphosphate—112lbs. per acre

Date of Planting.	Variety	Maturity.	Computed Yields per Acre.					Average.
			Sec. 1.	Sec. 2.	Sec 3.	Sec. 4.	Sec 5.	
			bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.
1927. April 28	Yandilla King	Late	6 48	8 48	8 16	9 4	10 0	8 35
May 18	Nabawa (Control)	Midseason ...	6 32	7 20	8 32	7 52	8 48	7 49
April 28	Baroota Wonder Early	Late midseason	9 20	8 24	10 8	10 8	12 8	10 12
April 28	Nabawa ...	Midseason ...	10 8	10 8	11 20	12 48	12 56	11 28
May 18	Nabawa (Control)	Midseason ...	8 16	7 4	5 4	8 40	7 12	7 15
April 28	Gallipoli ...	Late midseason	10 16	10 32	10 40	13 4	12 16	11 22
April 28	Gluyas Early	Early ...	10 16	11 12	10 40	11 44	11 36	11 6
May 18	Nabawa (Control)	Midseason ...	7 20	7 36	7 36	9 36	8 8	8 3
April 28	Canberra ...	Early ...	11 36	11 28	12 0	9 28	13 20	11 34

MAY PLANTING.

Seed—45lbs. per acre. Superphosphate—112lbs. per acre.

Date of Planting.	Variety.	Maturity.	Computed Yields per acre. Sec. 1.	Sec. 2.	Sec. 3.	Sec. 4.	Sec. 5.	Average.
1927.			bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.
May 16	Yandilla King	Late	5 12	4 56	5 52	7 52	6 40	6 6
May 18	Nabawa ...	Midseason ...	9 4	10 16	11 44	12 40	12 40	11 17
May 16	Baroota Wonder	Late midseason	7 20	8 24	9 52	9 52	10 24	9 10
May 16	Gallipoli ...	do.	9 12	9 4	10 24	11 20	10 40	10 8
May 18	Nabawa ...	Midseason ...	9 44	11 28	12 24	11 44	12 8	11 30
May 18	Gresley ...	Early ...	10 40	10 32	12 32	12 0	11 36	11 28
May 18	Canberra ...	Early ...	9 44	11 12	12 24	12 32	11 36	11 30
May 18	Nabawa ...	Midseason ...	10 0	10 32	12 8	11 28	10 40	10 58
May 17	Carrabin ...	Early ...	11 4	11 4	12 56	11 36	11 44	11 41
May 17	Comeback ...	do. ...	7 20	8 24	10 8	8 56	9 44	8 54
May 18	Nabawa ...	Midseason ...	10 8	10 32	13 28	12 24	12 40	11 50
May 17	Merredin ...	Early ...	7 52	9 28	10 16	10 16	9 28	9 28
May 18	S.H.J. ...	Very Early ...	7 36	9 12	11 4	10 8	10 56	9 47
May 18	Nabawa ...	Midseason ...	9 4	10 40	11 28	11 20	11 28	10 48
May 17	Noongaar ...	Very Early ...	8 8	9 4	8 24	9 4	9 20	8 48

JUNE PLANTING.

Seed—45lbs. per acre. Superphosphate—112lbs. per acre.

Date of Planting.	Variety.	Maturity.	Computed Yields per Acre. Sec. 1.	Sec. 2.	Sec. 3.	Sec 4.	Sec. 5.	Average.
1927.			bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.
June 20	Nabawa ...	Midseason .	5 4	4 24	4 32	4 16	3 44	4 48
May 19	Nabawa (Control)	do ...	9 36	8 0	8 48	8 40	8 0	8 37
June 20	Carrabin ...	Early ...	6 40	6 32	6 56	6 56	6 16	6 40
June 20	Gluyas Early	Early ...	3 52	5 4	5 36	5 36	4 40	4 58
May 19	Nabawa (Control)	Midseason ..	8 56	6 8	8 24	8 56	7 20	7 57
June 20	Canberra ...	Early ...	6 16	5 28	6 32	6 32	5 52	6 8
June 20	Merredin ...	do. ...	5 36	4 24	5 12	6 8	4 32	5 10
May 19	Nabawa (Control)	Midseason ...	8 8	8 0	7 28	9 12	6 56	7 57
June 20	Gresley ...	Early ...	8 8	5 36	5 20	6 16	5 20	6 8
June 20	S.H.J. ...	Very Early ...	4 16	4 52	5 12	6 24	5 52	5 19
May 19	Nabawa (Control)	Midseason ...	8 8	7 44	7 28	8 40	6 24	7 41
June 20	Noongaar ..	Very Early ...	4 32	4 56	5 4	5 28	...	5 0

The yield from this plot is so obviously below the average that some interference must have eventuated and therefore the result is not taken.

As at the Chapman and Merredin Experiment Farms the above results are for one year only and no definite conclusions can be drawn. All varieties of the April planting yielded better than the control variety ("Nabawa") planted in May. However, until continued experiments of this nature have proved otherwise, it is not advisable to plant early varieties in April. These varieties planted at this time are particularly liable to be affected by the disease Septoria, owing to their maturing out of season.

These results indicate, however, that reduced yields may be expected with all varieties when seeding is delayed until June.

WESTERN AUSTRALIA'S FIRST 1,000lbs. BUTTER COW.

P. G. HAMPSHIRE,
Superintendent of Dairying.

The Department of Agriculture has great pleasure in announcing the particulars of the production of the first 1,000 lbs. butter production cow in this State. The cow to achieve this proud distinction is Mr. A. W. Padbury's Guernsey cow "Picton's Trequean Flirt," Registered No. 747, aged 6 years 1 month. For a period of 365 days this cow yielded 16,675 lbs. milk, 870.06 lbs. butter fat, equal to 1,048.26 lbs. butter, and on the last day of test produced 35 lbs. milk and 1.885 fat. The test commenced on 23rd April, 1927, and concluded on 18th April, 1928. "Picton's Trequean Flirt" proved a remarkably consistent producer, apart from a decided drop in yield as a result of being sent to the Royal Agricultural Show from Koojan and being absent from the farm about fourteen days.

This Guernsey cow is not only an outstanding producer, but is also of exceptional breed type, securing the Championship in the Guernsey Class at the last Royal Agricultural Show, Perth, and being highly commented upon by the Judge—Dr. Kinross, President of the Guernsey Cattle Society of Australia. "Picton's Trequean Flirt" has been a consistent breeder and heavy milker. On her second calf she produced 449 lbs. butter fat, equal to 539 lbs. commercial butter in 273 days' test.

During the record production just completed, "Picton's Trequean Flirt" carried a calf 181 days, and is due to calve again this month. During the first five months of the record production she was milked three times daily, the last seven months twice daily.

Green, succulent pasture was available for only a short period of the year, the rainfall at Koojan being 16 inches per annum. This cow's yield is a remarkable tribute to the value of silage in the semi-dry areas of this State, as, without it, no green feed was available at Koojan for seven months.

During the period of test an accurate record has been kept by the offical testers (three officers check the yield at different periods) of the feed consumed by this cow, and the cost has been determined at ruling market rates. The accompanying charts show these particulars, together with the animal's breeding and monthly yields and values. After deducting the cost of feeding, and making deductions for the separation of the milk and providing for sufficient skim milk for feeding the calf, this cow shows a net of £47 9s. 6d.

Mr. A. W. Padbury and his herdsman (R. Guest) are to be congratulated upon the magnificent performance of this splendid Guernsey cow.

Breed: Guernsey. Sex: Female. Colour: Orange and Wh'te. Name: "PICTON'S TREQUEAN FLIRT," 747 A.G.H.B. Owner's Name: A. W Padbury, Koojan, W.A. Age: Born, 5th March, 1921. Bred by Ray Bros., Wellington Park Address: Picton, N.S.W.	Sire—"MINNAMURRA GAY BOY," 113 Bred by Kinross Bros., Inverell N.S.W.	G. Sire—"HAYES' CHERUB" (imp.) 23	G.G. Sire—"GAY BOY," 2020 E.G.H.B.
			G.G. Dam—"HAYES' GOLDEN CHERRY IV," 6901, E.G.H.B.
		G. Dam—"DUNALPINE EMPRESS," 43	G.G. Sire—"HAYES' CHERUB," 23 (imp.)
			G.G. Dam—"HAYES' EMPRESS," 8093, E.G.H.B. (imp.)
	Dam—"PICTON'S TREQUEAN VIOLET," 750 Bred by Ray Bros., Wellington Park, Picton, N.S W.	G. Sire—"MINNAMURRA'S GAY BOY," 113	G.G. Sire—"HAYES' CHERUB," 23 (imp.)
			G.G. Dam—"DUNALPINE EMPRESS," 43
		G. Dam—"TREQUEAN FANNY". (imp). 191	G.G. Sire—"DUKE SEQUEL" 1925, E.G.H.B.
			G.G. Dam—"FANNY DU FOULON XIX," 7255, E.G.H.B.

MONTHLY STATEMENT OF EXPENDITURE FOR FEED AND RECEIPTS FROM SALE OF PRODUCTION.

Cost of Feed.	Butterfat Produced.	Butter Factory Price, per lb.	Value.	Milk produced.	Skim Milk.	Value at 2d. per gallon.	Total Value of Butterfat and Skim Milk.
£ s. d	lbs.	s. d.	£ s d.	gallons.	gallons.	£ s. d.	£ s. d.
2 0 4½	82·86	1 7	6 11 2	159	143	1 3 10	7 15 0
2 6 8½	83·82	1 7	6 12 8	169½	152½	1 5 5	7 18 1
3 14 10½	90·72	1 8	7 11 2	178½	160½	1 6 9	8 17 11
3 8 6½	81·12	1 8	6 15 2	153	138	1 3 0	7 18 2
3 4 1½	85·02	1 8	7 1 8	156	140	1 3 4	8 5 0
2 19 8	69·15	1 8	5 15 3	144	130	1 1 8	6 16 11
3 8 0½	68·79	1 8	5 14 8	133½	120½	1 0 1	6 14 9
1 17 11	60·63	1 8½	5 3 7	123	111	0 18 6	6 2 1
2 7 5½	68·97	1 8½	5 17 10	117	105	0 17 6	6 15 4
2 17 6	61·95	1 7	4 18 1	105	95	0 15 10	5 13 11
3 4 4	51·06	1 7	4 0 10	106½	95½	0 15 11	4 16 9
3 7 8½	65·97	1 7	5 4 5	122½	110½	0 18 5	6 2 10
34 17 3	870·06	...	71 6 6	1,667½	1,501½	12 10 3	83 16 9
		Less cost of Feed				£34 17 3	
		Less 180 gallons Skim Milk for rearing Calf . .				1 10 0	
							36 7 3
							£47 9 6

AGE OF COW AT COMMENCEMENT OF TEST—6 YEARS 1 MONTH.

Month.	Milk.	Test.	Butter Fat.	Milk for Month.	Butter Fat for Month.	Feed per day each Month.
1927.	lbs.	%	lbs.	lbs.	lbs.	
May 26	15½	5·4	·837	...	...	6lbs. bran, 3lbs. pollard, 2lbs. linseed meal, 20lbs. silage (wheaten and oaten) pasture, natural grasses.
	14	6·2	·868	...	...	
	23½	4·5	1 057	1 590	82·86	
June 23	16½	5 3	·874	...	...	6lbs. bran, 4lbs. pollard, 3lbs. linseed meal, 20lbs. silage (wheaten and oaten), pasture, natural grasses.
	14	6·1	·854	...	...	
	26	4·1	1·066	1,695	83·82	
July 21	18½	5·6	1·036	...	...	16lbs. oaten chaff, 6lbs. bran, 4lbs. pollard, 3lbs. linseed meal, 20lbs. silage (wheaten and oaten) pasture, oat crop and natural grasses.
	15	5·8	·870	...	...	
	26	4·3	1·118	1,785	90·72	
Aug. 18	16	5·5	·880	...	...	16lbs. oaten chaff, 6lbs. bran, 4lbs. pollard, 2lbs. linseed meal, pasture—oaten crop and natural grasses.
	12	6·0	·720	...	...	
	23	4·8	1·104	1,530	81·12	
Sept. 15	18	5·5	·994	...	...	10lbs. oaten chaff, 6lbs. bran, 4lbs. pollard, 3lbs. linseed meal, pasture—oat crop and natural grasses.
	12	6·2	·744	...	...	
	22	5·0	1·100	1,560	85·02	
Oct. 18	15	4·5	·675	...	...	16lbs. oaten chaff, 8lbs. bran, 4lbs. pollard. Pasture—natural grasses.
	13	5·0	·650	...	...	
	20	4·9	·980	1,440	69·15	
Nov. 18	17½	5·7	·997	...	...	18lbs. oaten chaff, 6lbs. bran, 3lbs. linseed meal. Pasture—natural grasses (dry.)
	27	4·8	1·296	1,335	68·79	
Dec. 15	14½	5·9	·855	...	...	3lbs. bran, 3lbs. pollard, 3lbs. crushed oats, 2lbs. linseed meal, 30lbs. silage. Pasture—natural grasses (dry.)
	26½	4·4	1·166	1,230	60·63	
1928.						
Jan. 12	19	6·1	1·159	...	...	6lbs. bran, 5lbs. crushed oats, 3lbs. linseed meal, 14lbs. silage, 10lbs. elephant grass pasture—natural grasses (dry.)
	20	5·7	1·140	1,170	68·97	
Feb. 8	15	6·3	·945	...	...	7lbs. bran, 4lbs. crushed oats, 6lbs. linseed meal, 16lbs. silage. Pasture—natural grasses (dry.)
	20	5·6	1·120	1,050	61·95	
Mar. 20	14	5·4	·756	...	...	7lbs. bran, 2lbs. pollard, 4lbs. crushed oats, 6lbs. linseed meal, 16lbs. silage, 10lbs. elephant grass. Pasture—natural grasses (dry.)
	21½	4·4	·946	1,065	51·06	
April 18	15	5·5	·825	...	...	7lbs bran, 2lbs. pollard, 4lbs. crushed oats, 4lbs. linseed meal, 20lbs. silage, 20lbs. elephant grass. Pasture—natural grasses (dry.)
	20	5·3	1·060	1,225	65·95	
Total ...	...	Av. Test 5·21	...	16,675	870·06	Equal to 1,048·26lbs. commercial butter.

HERD TESTING.

THE OFFICIAL AUSTRALIAN PURE BRED DAIRY CATTLE PRODUCTION TESTING SCHEME.

Conducted by Department of Agriculture, Western Australia.

Name of Cow.	Owner.	Breed.	Herd Book No.	Age.		Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last day of Test.	Sire.
				Yrs.	Mths.			lbs.	%	lbs.	lbs.	
MATURE COWS—STANDARD 350 LBS. BUTTER FAT.												
Picton's Trequean Flirt ...	A. W. Padbury ...	Guernsey...	747	6	1	18-4-27	273	13,452	5·18	697·98	39	Minnamurra's Gay Boy, 113
Daisy 2nd of Garden Hill ...	Walker & Co. ...	Jersey ...	10,629	5	11	29-1-27	273	9,372	5·28	495·22	24	Macaw of Banyule. 1754
Gentle of Blackheath	E. McManus ...	M.S. ...	11,679	7	2	17-11-26	273	11,748	4·10	481·84	31	Flower's Mayfield of Blackheath, 370
Carnation 3rd of Greyleigh ...	do.	do. ...	...	5	4	18-5-27	273	11,500	4·0	459·89	23½	Foch of Greyleigh
Mokine Clove Carnation ...	Walker & Co. ...	Jersey ...	11,796	5	7	7-6-27	240	6,495	6·23	405·00	21	Noble's best of Garden Hill, 1756
Blanche 2nd of Homleigh ...	E. McManus ...	M.S. ...	9,081	8	8	19-5-27	273	10,564	3·71	392·29	16½	Prince of Homeleigh 517
Pride 3rd of Blackheath ...	Sanatorium Farm ...	do. ...	14,419	6	6	11-9-27	273	10,996	3·56	391·98	25½	Eclipse of Blackheath, 974
Treasure 3rd of Homeleigh ...	E. McManus ...	do. ..	14,950	7	0	2-1-27	273	8,026	4·81	386·67	25½	Defender of Homeleigh, 944
Milton's Daisy 2nd ...	A. W. Padbury ...	Guernsey. .	922	6	0	1-8-27	273	7,800	4·93	385·04	15	Wickham Goldraiser, 214
Colleen of Rosewood	Dept. of Agriculture	do. ...	819	5	7	17-8-27	273	7,161	4·93	353·10	12	Archer of Nundorah, 76
Gladness 2nd of Wollongbar ...	do.	do. ...	631	5	10	16-3-27	273	6,264	5·37	336·38	13	Faithful Fido of Wollongbar, 81
Velvet of Wollongbar	do.	do. ...	774	5	6	10-11-26	210	6.480	4 56	295·81	15	Faithful Fido of Wollongbar, 81
Milkmaid 1st of Blackheath ...	H. O. Simms ...	M.S. ...	10,091	8	5	14-12-26	273	6,780	4·31	292 20	20	Flower's Mayfield of Blackheath, 370
Thelma of Blackheath	do.	do. ...	12,847	6	3	10-12-26	273	6,201	4·08	253·01	7	Flower's Mayfield of Blackheath, 370
Oakford Caprice	H. G. Walton ...	Red Poll...	1134AA	6	1	17-11-26	273	4,336	4·29	186·02	15½	Oakford Bloodstone, 416 AA
Mokine Empire Lily 7th ...	T. H. Wilding ...	Jersey ...	11794	6	3	29-11-27	30	1,665	5·14	85·59	55½	Ettie's Chief of Banyule, 1757
COWS OVER 4½ YEARS AND UNDER 5 YEARS—STANDARD 325 LBS. BUTTER FAT.												
Rye Calara of Cross Vale ...	R. H. Rose... ...	Jersey ...	15701	4	10	29-8-27	273	7,107	6·33	450·48	14	Rye Duke of Glen Iris, 1994
Golden Pearl 4th of Wollongbar	Dept. of Agriculture	Guernsey...	863	4	10	2-12-26	273	6,612	5·31	351·16	19	Judge of Wollongbar, 184
Dinah 2nd of Wollongbar ...	do.	do. ...	832	4	11	6-2-27	273	6,516	4·71	307·16	12	Judge of Wollongbar, 184
COWS OVER 4 YEARS AND UNDER 4½ YEARS—STANDARD 300 LBS. BUTTER FAT.												
Fancy of Moorlands	P. Rose	Jersey ...	14343	4	3	9-6-27	240	4,725	5·31	251·25	7	Noble's Advance of Garden Hill, 2278
Sunlight of Waterside	Wooroloo Sanatorium	M.S. ...	14724	4	3	22-1-27	273	4,656	4·93	229·64	12	Masher of Mayfield, 1135
Grantara Sadie	H. G. Walton ...	Red Poll...	1233A	4	4	28-8-27	273	4,563	4·29	195·67	6	Victoria Werribee, 516A
COWS OVER 3½ YEARS AND UNDER 4 YEARS—STANDARD 275 LBS. BUTTER FAT.												
Koojan Rosebud...	A. W. Wilson ...	Guernsey...	1260	3	7	15-4-27	273	6,402	5·10	326·47	14	Robin of Nundorah, 417
Virginia 20th of Darbalara ...	W. Burges ...	M.S. ...	14858	3	11	2-8-27	273	7,530	4·26	321·25	10	Expert of Darbalara, 1608
Mokine Empire Lily 8th ...	T. H. Wilding ...	Jersey ...	20916	3	10	19-4-27	273	5,091	6·15	313·18	17	Ettie's Chief of Banyule, 1757
Wooroloo Redwing	Sanatorium Farm...	M.S. ...	NYA	3	8	18-7-27	273	7,737	3·84	299·40	19	Commercial of Blackheath, 2001
Parson's Red Rose 31st of Wollongbar	Dept. of Agriculture	Guernsey...	985	3	11	31-10-26	273	5,589	4·99	278·99	13	Rose Boy of Wollongbar, 315

Betty of Moorlands	P. Rose	Jersey ...	15683	3	11	12–6–27	240	4,665	5·50	256·77	9	Noble's Advance of Garden Hill. 2273
Dover 6th of Kelvin Park ...	Hospital for Insane	M.S. ...	NYA	3	9	14–6–27	273	6,783	3·60	244·57	11	Daddy Xmas of Croobyar, 928
Priscilla 10th of Darbalara ...	W. G. Burges ...	do. ...	14457	3	11	21–9–27	210	4,755	4 66	221·73	7½	Melbourne of Darbalara 1142
Fancy 2nd of Kelvin Park ...	Hospital for Insane	do. ...	NYA	3	9	27–3–27	273	7,303	2·95	215·60	19½	Treasure of Gleneira, 1879
Grantara Pebble	H. G. Walton ...	Red Poll ...	1232A	3	7	15–3–27	273	4,510	4·23	190·84	13½	Victoria Werribee, 516A
Perce's Rye Capture of Grass Vale	R. H. Rose ...	Jersey ...	15699	3	9	3–5–27	120	3,270	5·71	186·78	25	Rye Duke of Glen Iris, 1994
Mokine Fancy 2nd	T. H. Wilding ...	do. ...	19131	3	10	16–8–27	120	3,015	5·0	150·84	23½	Ettie's Chief of Banyule, 1757
Grantara Sadie...	H. G. Walton .	Red Poll ...	1233A	3	6	20–10–26	273	2,914	4·59	133·85	6½	Victoria Werribee, 516A

COWS OVER 3 YEARS AND UNDER 3½ YEARS—STANDARD 250 LBS. BUTTER FAT.

Koojan Dawn	Dept. of Agriculture	Guernsey...	1252	3	2	19–8–27	293	8,782	4·56	400·50	22½	Robin of Nundorah, 417
Wollongbar Dessie 2nd ...	Muresk Agricultural College	do. ...	1121	3	1	30–5–27	273	4,947	5·74	283·97	9	Renown of Wollongbar, 334
Wollongbar Realm 2nd ...	do. do.	do. ...	1151	3	5	17–5–27	273	5,167	5·11	264·35	12½	Bellman of Wollongbar, 334
Duchess 4th of Kelvin Park ...	Hospital for Insane	M.S. ...	NYA	3	5	24–5–27	273	6,840	3·67	251·15	20	Daddy Xmas of Croobyar, 928
Cherry 5th of Kelvin Park	do.	do. ...	NYA	3	4	14–2–27	273	5,976	4 16	248 75	17	Daddy Xmas of Croobyar, 928
Jessie of Moorlands	P. Rose	Jersey ...	16858	3	5	28–5–27	273	4,687	4·73	221·89	7½	Vesta 2nd Twylish of Coorah, 1870
Grantara Jacinth	H. G. Walton ...	Red Poll ...	1231A	3	5	19–8–27	273	6,103	3·60	220·12	4½	Victoria Werribee, 516A
Sparkle of Trelawney	Walker & Co. ...	Jersey ...	20914	3	3	10–9–27	150	4,875	4·46	217 81	26	Trelawney, 3426
Koojan Bonnie Princess ...	Dept. of Agriculture	Guernsey...	1251	3	2	21–7–27	240	3,480	5·12	178·32	9	Golden King of Koojan, 369
Wollongbar Modesty 2nd ...	Muresk Agricultural College	do. ...	1134	3	1	17–2–27	273	2,842	5·71	162 46	7½	Bounty of Wollongbar, 336
Mokine Columbine 3rd	T. H. Wilding ...	Jersey ...	19180	3	5	20–8–27	90	2,715	5·42	147·21	30½	Mokine Duke, 3428
Bock of Moorlands	P. Rose	do. ...	17959	3	3	9–8–27	90	2,595	5·4	140·19	25	Noble's Advance of Garden Hill, 2273

HEIFERS OVER 2½ YEARS AND UNDER 3 YEARS—STANDARD 225 LBS. BUTTER FAT.

Koojan Dulcie	A. W. Padbury ...	Guernsey...	1255	2	9	10–1–27	273	5,563	5·97	332·20	19½	Robin of Nundorah, 417
Pansy 5th of the Hill	W. G. Burges ...	M.S. ...	NYA	2	6	6–8–27	273	8,131	3·83	311·86	25½	Crescent of the Hill, 2016
Lassie Fowler of Moorlands ..	P. Rose	Jersey ...	17963	2	7	12–5–27	273	5,911	5·22	308·64	7	Grafter of Melrose, 3560
Girlie 4th of Sarnia	F. P. Attwell ...	do. ..	17943	2	10	12–6–27	273	5,889	5·22	307·58	13	Werribee Starbrights Butter King, 2397
Belle 4th of Claremont ...	Hospital for Insane	M.S. ..	NYA	2	8	23–11–26	273	7,470	3·99	298·59	25	Telyarup Prince of Claremont, 2852
Matilda 7th of Berry	W. G. Burges ..	do. ...	14074	2	11	13–1–27	273	6,454	4·12	266·11	21½	Rutland of Darbalara, 575
Lydia of Moorlands	P. Rose	Jersey ...	19107	2	6	27–6–27	240	5,880	4·48	263·54	4½	Top Notch of Roelands, 4011
Lady 1st of Wooroloo	Sanatorium Farm ...	M.S. ...	NYA	2	8	18–6–27	273	6,265	3·96	248·41	13½	Commercial of Blackheath, 2001
Queen of Moorlands	P. Rose	Jersey ...	16860	2	11	12–6–27	273	4,524	5·48	248·30	8	Vesta 2nd Twylish of Coorah, 1870
Spurfield Air Girl 2nd ..	Muresk Agricultural College	Guernsey...	1048	2	8	1–1–27	273	4,396	5·51	242·40	15½	Milton's Stedfast, 292
Dahlia 5th of Berry	W. G. Burges ...	M.S. ...	NYA	2	11	20–1–27	273	5,625	4·26	239·78	15	Mirth of Berry, 1716
Dewdrop 4th of Berry	W. G. Burges ...	do. ...	13434	2	11	6–12–26	273	5,644	4·12	232·60	16½	Newhaven of Darbalara, 1174
Ivy of Moorlands	P. Rose	Jersey ...	19106	2	6	12–8–27	240	4,830	4·62	223·25	10	Grafter of Melrose, 3560
Spurfield Angelica 2nd	Muresk Agricultural College	Guernsey..	1051	2	7	26–6–27	273	3,694	5·44	201 02	11½	Milton's Stedfast, 292
Helen of Moorlands	P. Rose	Jersey ...	17961	2	9	10–7–27	210	3,885	4·84	188·37	7½	Top Notch of Roelands, 4011
Mercedes Sweet Ginger of Glen Iris	A. W. Green ...	do. ...	16679	2	11	13–9–27	150	2,670	5·80	154·86	12	Mercedes Sweet Duke of Glen Iris, 2982
Grantara Rene	H. G. Walton ...	Red Poll ...	1594A	2	9	30–4–27	273	4,041	3·62	146·66	7	Victoria Werribee, 516A
Jessie Lind of Grass Vale ...	R. H. Rose ...	Jersey ...	17965	2	11	4–5–27	120	2,370	5·29	125·37	18	Rye Duke of Glen Iris, 1994

HERD TESTING—*continued.*

Name of Cow.	Owner.	Breed.	Herd Book No.	Age.		Date of Calving.	No. of Days in Test.	Weight of Milk for Period.	Average Test.	Total Butter Fat.	Weight of Milk Last day of Test.	Sire.
				Yrs.	Mths.							
HEIFERS UNDER 2½ YEARS—STANDARD 200 LBS. BUTTER FAT.												
Pinkie 8th of the Hill	W. G. Burges	M.S.	NYA	2	5	4-8-27	273	8,355	4·40	368·29	25	Crescent of the Hill, 2016
Denmark Anne	Dept. of Agriculture	Guernsey	1164	2	3	1-6-27	273	6,264	5·31	332·92	18	Linwood of Wollongbar, 381
Denmark Red Rose	do. do.	do.	1357	2	0	19-7-27	273	4,897	5·75	282·00	12½	Rose Chief of Wollongbar, 130
Koojan Lady Buller	A. W. Wilson	do.	1259	2	0	5-7-27	273	5,097	5·16	263 43	14	Robin of Nundorah, 417
Spring Park Starbright	A. W. Green	Jersey	NYA	1	11	27-7-27	273	4,374	5·56	243·37	13	Mercedes Noble Prince or Glen Iris, 3335
Newry Daisy	G. Berryman	Guernsey	1247	2	2	19-7-27	273	4,044	6 01	243 24	8	Sheriff of Koojan, 424
Koojan Dolly	A. W. Wilson	do.	1254	2	1	7-7-27	273	5,613	4 30	241·41	16	Robin of Nundorah, 417
Tessie of Garden Hill	W. Padbury	Jersey	17957	2	5	23-2-27	273	3,768	6·37	239·15	11	Cream Socks of Glen Iris, 1410
Princess 6th of Berry	W. G. Burges	M.S.	NYA	2	2	13-1-27	273	5,636	4·23	238 42	20½	Rutland of Darbalara, 575
Beryl of Moorlands	P. Rose	Jersey	20886	2	0	18-7-27	240	4,665	4·83	225 66	8	Grafter of Melrose, 3560
Wollongbar Golden Pearl 5th	Muresk Agricultural College	Guernsey	1128	2	5	16-2-27	273	3,864	5 80	224·46	13	Judge of Wollongbar, 184
May 1st of Wooroloo	Sanatorium Farm	M.S.	NYA	1	8	8-4-27	273	5,416	4·12	223·42	15½	Commercial of Blackheath, 2001
Wooroloo Beauty	do.	do.	NYA	2	4	20-1-27	273	4,837	4·61	223·38	17½	Commercial of Blackheath, 2001
Hazel of Moorlands	P. Rose	Jersey	20891	2	0	4-7-27	240	4,380	5·01	219·54	7	Grafter of Melrose, 3560
Shiela 2nd of Sarnia	F. P. Attwell	do.	20862	2	3	7-4-27	273	3,478	6·27	218·15	9½	Wernbee Starbrights Butter King, 2,397
Newry Lass	S. Bevan	Guernsey	NYA	1	9	12-6-27	273	3,285	6 23	204·82	8½	Sheriff of Koojan, 424
Audrey of Moorlands	P. Rose	Jersey	20883	2	0	19-8-27	210	4,140	4·93	204 24	8½	Colonel of Melrose, 4015
Gem 6th of Garden Hill	W. Padbury	do.	18563	2	0	26-11-26	273	3,091	6 30	192 84	5½	Reality of Garden Hill, 3095
Madrigal 2nd of Warenda	A. W. Green	do.	NYA	1	10	25-9-27	210	3,675	5·23	192·24	17	Kinnor of Banyule, 2727
Dorinda of Moorlands	P. Rose	do.	19105	2	5	4-9-27	210	3,960	4·99	187·86	10½	Grafter of Melrose, 3560
Jewel of Moorlands	do.	do.	20892	2	1	8-9-27	210	3,675	5·04	185·47	10½	Grafter of Melrose, 3560
Joan of Moorlands	do.	do.	20893	1	11	17-8-27	210	3,960	4·61	182·88	6	Grafter of Melrose, 3560
Nan of Claremont	Hospital for Insane	M.S.	NYA	2	1	2-11-26	273	4,413	4·14	182·74	16	Norval of Darbalara
Winnie of Claremont	do.	do.	NYA	2	4	9-10-26	273	4,354	4·19	182·50	11½	86th Duke of Pentland
Bemil of Moorlands	P. Rose	Jersey	20885	2	0	20-9-27	210	4,005	4·49	180 12	9	Colonel of Melrose, 4015
Folly of Moorlands	do.	do.	20889	1	11	11-8-27	210	3,555	4·87	173·19	8½	Colonel of Melrose, 4015
Bloom of Moorlands	do.	do.	20887	2	2	8-8-27	210	3,360	5·03	169 09	8½	Grafter of Melrose, 3560
Koojan Bonnie Katherine	A. W. Padbury	Guernsey	1250	2	2	22-9-27	120	2,805	5·67	1[illegible]·12	22	Robin of Nundorah, 417
Juliet 2nd of Juadine	Walker & Co.	Jersey	NYA	2	0	10-9-27	150	3,090	4·93	152·52	16	Fascinator of Garden Hill, 2754
Bud of Moorlands	P. Rose	do.	20888	2	0	27-8-27	180	2,940	4·89	143·94	8	Grafter of Melrose, 3560
Rene of Moorlands	do.	do.	19108	2	5	11-8-27	90	2,895	4·59	133·05	30	Grafter of Melrose, 3560
Nymphea 2nd of Juadine	Walker & Co.	do.	NYA	2	0	15-8-27	180	2,460	5·36	132·00	11½	Fascinator of Garden Hill, 2754
Gwen of Moorlands	P. Rose.	do.	20890	1	10	10-8-27	210	2,400	5·49	131·70	5½	Colonel of Melrose, 4015
Banker's Lady of Trelawney	Walker & Co.	do.	NYA	2	2	6-9-27	150	2,475	5·18	128·37	14	Banker of Garden Hill, 3092
Coquette of the Hill	W. G. Burges	M.S.	NYA	2	3	22-5-27	180	2,895	3·62	105·03	4½	Crescent of the Hill, 2016
Butter of Moorlands	P. Rose	Jersey	19104	2	5	8-9-27	30	1,080	4·65	50·28	36	Colonel of Melrose, 4015
Beauty of Moorlands	do.	do.	20884	2	1	13-9-27	30	885	4·55	40·17	29½	Colonel of Melrose, 4015
365 DAYS TEST.												
Picton's Trequean Flirt	A. W. Padbury	Guernsey	747	6	1	18-4-27	365	16,675	5·21	870·06	35	Minnamurra's Gay Boy, 113
Daisy 2nd of Garden Hill	Walker & Co.	Jersey	10629	5	11	29-1-27	365	11,240	5·31	597·00	19	Macaw of Banyule, 1754

FRUIT-FLY
(Ceratitis capitata).
BAITING AND TRAPPING EXPERIMENTS.

By
L. J. NEWMAN, Entomologist, and INSPECTOR CAHILL.

The objects of these experiments were threefold.

1st. To test the relative effectiveness of foliage poison baiting *versus* the trapping or luring method.

2nd. To demonstrate the advantages gained in poisoning or trapping the female fruit-fly before she reaches the egg-laying stage.

3rd. To test the substitution of Arsenate of Soda for Arsenate of Lead as the poison in the foliage bait.

By kind permission of Mr. Ilbury, of Mundaring, his orchard was placed at our disposal in which to make the experiments.

The trials were commenced on February, the 11th, and terminated on March the 9th, a period of 28 days.

The method adopted was as follows:—Six peach trees of the same variety, carrying fruit, were selected. Each of the trees was framed around with timber, over which a stout fly-proof netting was nailed.

The ground beneath the netted trees was also covered with a strong calico.

View of experimental cages as constructed over Peach trees.

The trees were numbered 1 to 6, the 6th being used as the control or check. To make the conditions as natural as possible, a vessel containing water, easily available to the flies was placed in each covered tree.

Trees No. 1, 2, and 5 were foliaged baited. Trees No. 3 and 4 had two traps placed in each, carrying the lure.

Tree No. 6 was not treated in any way other than being covered.

Into each of the trees, 1, 2, 3 and 4, on February 11th, 50 fruit-flies were liberated. Trees 1, 2, were at once baited, traps containing the lure being suspended in Trees 3 and 4. Tree No. 5 was not baited nor flies liberated therein until the 13th.

In Trees No. 1 to 5, the flies consisted of 38 females and 12 males.

In Tree No. 6, control, they were divided into 40 females, *plus* 10 males.

Each day of the experiment the trees were officially visited. Daily records of dead or captured flies and the number of infested fruits found on trees and ground beneath, were carefully made. All infested fruits found, were daily destroyed.

Trees No. 1 and 2 were both treated with the foliage bait, as advised by the Department of Agriculture.

Powdered Arsenate of Lead	$2\frac{1}{2}$ ozs.
Molasses	4 lbs.

Juice of 1 doz. Oranges.
Water to make 4 gallons.

The ingredients were thoroughly mixed and applied every 7th day per medium of a syringe. Four applications to foliage were made.

Into tree No. 1 50 fruit-flies were introduced consisting of 38 females under the egg-laying stage plus 12 males. In passing, it may be well to explain that the fruit-fly, after emerging from the pupa in the soil, is incapable of laying fertile eggs until she is 10 days old.

Into tree No. 2 the same number of flies were liberated. The difference in the experiment, however, was in the age of the flies.

In this instance the flies had all passed the 10-day stage and were ready for egg-deposition.

Daily records were taken which, when finally added, gave the following interesting and instructive results. Tree No. 1, flies under 10 days old, 12 per cent. of fruit infested with fruit-fly maggots. Tree No. 2, flies over 10 days old, 30 per cent. infested fruit, equalling $2\frac{1}{2}$ times more damaged fruit than tree No. 1.

Now why this disparity in the total loss of fruit, seeing that both trees were treated at the same time with the same bait?

The answer is found in the different ages of the flies submitted. The flies in tree No. 1 had not reached the egg-laying stage. They readily partook of the bait and were mostly poisoned off before they were ready to lay.

This would be the condition in an orchard where the trees were regularly foliage-baited once every seven days, the flies being poisoned off within the ten-day period.

In tree No. 2 the damage was greater, because the flies were ready to lay when submitted, and even though they partook of the bait, many eggs would be deposited in the ripening fruit before death ensued.

This is an illustration of what is likely to happen in an orchard or garden where baiting is not regularly and consistently done.

The secret of success in foliage-baiting depends upon the presence of available bait when the flies issue from the pupae.

They readily partake of the poisoned bait, and are thus destroyed before being capable of damage.

Trees No. 3 and 4—Trapping Experiment.—To test the value of this method as compared with foliage-baiting, trees No. 3 and 4 were in like manner supplied with 50 fruit-flies each. The flies in No. 3 tree were under 10 days old, those in tree No. 4 being ready for egg-laying.

The lure used in the traps was made of the following:—

Pollard 8ozs.; Powdered Borax 8 ozs.; Arsenate of Soda ¼oz. Water to make 1 gallon of liquid.

The ingredients were thoroughly mixed together in the water and allowed to steep for 16 hours.

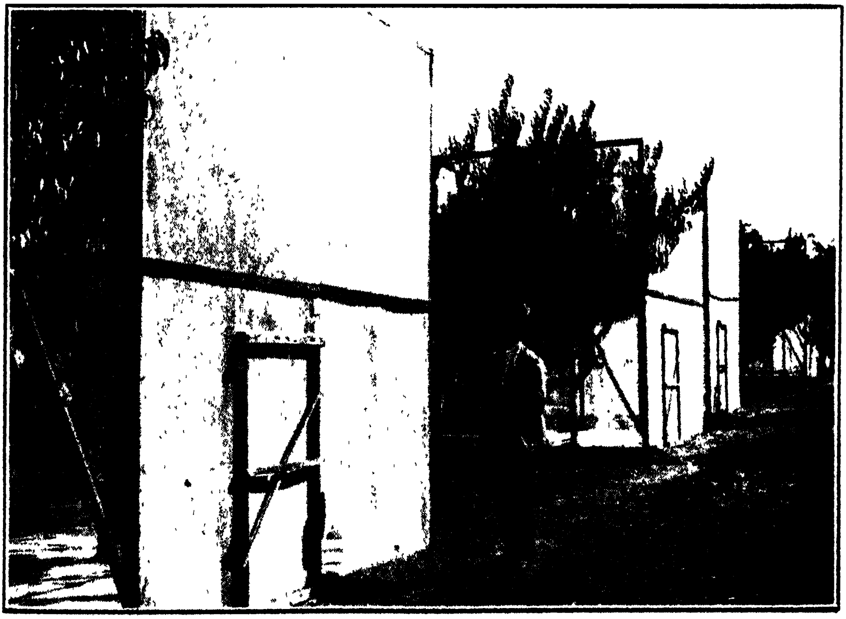
At the termination of this period, the mixture was again well shaken and allowed to stand.

A clear amber-coloured liquid resulted which was used in the traps. In each of the trees, two bright marginal-edged tins were hung of a capacity of ¾ of a pint. They were suspended about half way up the trees on the North-East and North-West sides.

Into each trap ½ pint of lure was placed, this being renewed every seven days. Like trees No. 1 and 2, these were daily visited and records made of all dead and trapped flies and infested fruits.

The summing up gave the following results:—Tree No. 3, flies under 10 days old when submitted, 5 per cent. infested fruit. Tree No. 4, flies ready to lay when liberated, 18 per cent. infested fruit.

A comparison with trees No. 1 and 2, foliage-baited, reveals that the trapping results are slightly better. It is also a further demonstration of the advantage of capturing the female flies before the egg-laying stage is reached.



Covered trees as viewed from different aspect.

Tree No. 5. This was used as an experiment to test the possible substitution of arsenate of soda for arsenate of lead.

The object of the test being to find a more rapid poisoning medium than at present being used in the foliage bait. Various strengths from ¼oz. of arsenate of soda down to one-thirtysecond of an oz. were tried.

The results were excellent from the point of view of destroying the flies. Unfortunately, at even as low a strength as one-thirtysecond of an oz. to the gallon, the leaves and young wood of the trees were burned. This experiment was therefore abandoned.

The spray containing ¼oz. of arsenate to the gallon could be very effectively used on gum leaves or other foliage suspended in the centre of the fruit tree.

Care would need to be taken to see that fruit was not brought into contact with the poison.

Tree No. 6. Control or check tree. This was of the same variety as the others, and in every respect received the same treatment, with the exception that foliage bait or traps were not used.

Except for the fact that the flies were confined to the tree, they were in no way molested.

Daily observations were made, all infested fruits being picked from tree and ground and recorded.

The final results revealed the enormous loss of 89 per cent. of the fruit, definitely proving what a destructive pest the fruit-fly is when left to work its own sweet will.

Tabulated records appended.

TABLE SHOWING RESULTS OF THE FIVE EXPERIMENTS, COMPARED WITH THE CONTROL OR CHECK.

Date Commenced.	Date terminated.	Total period.	Tree No.	Species of Fruit.	Method of treatment.	No. of treatments.	No. of flies liberated.	Conditions of flies.	Sound Fruits.	Unsound Fruits.	Bait or lure used.
1928. Feb. 11 ...	9-3-28	28 days	1	Peach	Foliage baiting	Four	50	38 females under egg laying stage; 12 males	% 88	% 12	2¼ oz. powdered arsenate of lead: molasses, 4lbs.; juice of 1 doz. oranges; water, 4 gallons.
Feb. 11 ...	9-3-28	28 „	2	do.	do.	do.	50	38 females ready for egg deposition; 12 males	70	30	do. do.
Feb. 11 ...	9-3-28	28 „	3	do.	Trapping or luring	do.	50	38 females under egg laying stage; 12 males	95	5	Two traps baited with the following—pollard, 8 ozs. powdered borax, 8 ozs.; arsenate of soda, ¼ oz: water, 1 gal.
Feb. 11 ...	9-3-28	28 „	4	do.	do.	do	50	38 females ready for egg deposition: 12 males	82	18	do. do.
Feb 13 ...	9-3-28	26 „	5	do	Foliage baiting	do.	50	38 females under egg laying stage	99	1	In this bait, arsenate of soda was substituted for arsenate of lead. It was used at the rate of ¼oz., ⅛, $\frac{1}{16}$ and $\frac{1}{32}$ of an oz. to the gal. Abandoned on account of foliage and fruit burn.
Feb. 11 ...	9-3-28	28 „	6	do.	Control no treatment	...	50	20 females under egg laying age; 20 females ready for egg deposition; 10 males	11	89	No treatment.

A summary of the results of the experiments show that foliage-baiting, when used correctly, does effectively control this pest.

That trapping or luring gave a 7 per cent. better result than foliage baiting.

The need for regular and consistent baiting or trapping is emphasised in the better results recorded in trees No. 1 and 3, as compared with trees No. 2 and 4.

It was also demonstrated that arsenate of soda was readily partaken of by the fruit-fly when incorporated with a sweetened fruit juice.

That arsenate of soda was a rapid killer, destroying many flies within 60 minutes of being applied.

That owing to foliage and fruit burning, arsenate of soda is not recommended as a fruit tree spray.

Tree No. 6 control is a striking illustration of what happens when no effort is made to control fruit-fly.

Table of comparisons.—For this purpose trees No. 1 and 3 will be compared with the control tree No. 6. Trees No. 3 and 4 represent conditions unfavourable to good control.

Tree No. 1.—Foliage-baited, 4 times. 88 per cent. clean fruit.

Tree No. 3.—Trapping or luring renewed 4 times. 95 per cent. clean fruit.

Tree No. 6.—Control, untreated, 11 per cent. clean fruit.

The above figures speak for themselves and prove that both foliage-baiting or trapping, as advised by the department, are effective means to use in our efforts to control this most serious fruit pest.

Trapping being shown by our experiments to be more effective than foliage-baiting, the question resolves itself into one of economics.

The comparative costs of the two methods must be considered.

The difference in favour of the trapping method is 7 per cent. extra sound fruit.

Foliage-baiting is done in half the time that it takes to tend, clean and renew the lure in the traps.

The conclusion therefore arrived at is that, in large areas the extra time and labour employed in the trapping method and the consequent increased cost, would more than offset the value of the 7 per cent. of fruit saved.

In small orchards and home gardens we consider the application of the trapping or luring methods the most effective.

Throughout these tests complete sanitation was carried out, all infested fruits being gathered from trees and ground daily.

RESULTS OF FIRST EGG-LAYING COMPETITION HELD AT MURESK AGRICULTURAL COLLEGE.

W. T. RICHARDSON,
Poultry Adviser.

The test commenced on 10th April, 1927, and terminated on 31st March, 1928, a period of 357 days.

The competition was controlled by a Committee of Management consisting of the College Principal (Mr. H. J. Hughes), a competitors' representative (Mr. R. B. Aiken) and the Poultry Adviser (Mr. W. T. Richardson).

Two sections were provided, *i.e* —

Section "A": Light Breeds—	
	72 White Leghorns.
Section "B": Heavy Breeds—	
	81 Black Orpingtons.
	6 Rhode Island Reds.
Total number of birds entered ..	159

In each section the competition was decided by the highest number of units obtained by each group of three birds, and by each individual bird in their respective sections.

A first grade egg was rated as one unit and a second grade egg as three-quarters of a unit.

During the first two months of the Competition, a first grade egg to weigh not less than 1¾ ozs., thereafter during the remainder of the Competition a first grade egg to weigh not less than 2 ozs.

The minimum weight of a second grade egg was 1½ ozs.

All birds were single pen tested and the actual weight of every egg laid was recorded.

The following were ineligible for prizes, under Regulation "8," owing to the eggs not attaining an average of 24 ozs. to the dozen during the week ending July 9th:—

GROUP PENS (3 BIRDS)

SECTION "A"—LIGHT BREEDS.

J. W. Davey	Birds Nos.	13, 14, 15
J. J. Jackson	„	34, 35, 36
J. McAllister	„	40, 41, 42
O. J. Patridge	„	52, 53, 54
S. J. Hanna	„	73, 74, 75

SECTION "B"—HEAVY BREEDS.

Yaldarra Poultry Farm	Birds Nos.	1, 2, 3
Durham & Hoops	„	13, 14, 15
S. J. Hanna	„	25, 26, 27
N. McDonald	„	37, 38, 39
F. B. Pepper	„	49, 50, 51
H. Spence	„	67, 68, 69
W. Youd	„	79, 80, 81
J. W. Balsdon	„	82, 83, 84
T. Parkinson	„	85, 86, 87

INDIVIDUAL BIRDS

SECTION "A"—LIGHT BREEDS.

T. Boulter	Bird No.	8
G. Davey	„	10, 11
J. W. Davey	„	13, 14
J B. Haagensen	„	30
J. J. Jackson	„	34, 35
J. McAllister	„	42
Neavedale Poultry Farm	„	45
O J. Patridge	„	52, 54
J. W. Russell	.	63
H. Swanson	„	64
Walker & Co.	„	68
S. J. Hanna	„	73, 74

SECTION "B"—HEAVY BREEDS.

Yaldarra Poultry Farm	Birds Nos.	1, 2
H. Childe	„	4
A. Collins	„	8
G. Davey	„	11
Durham & Hoops	„	14, 15
R. A. Dusting	„	16
S. J. Hanna	„	25, 26, 27
A. F. Lethbridge	„	31, 32
M. Love	„	34
N. McDonald	„	38, 39
Neavedale Poultry Farm	„	41, 44
T. Parkinson	„	46
F. B. Pepper	„	50, 51
D. F. Robinson	„	61
H. Spence	„	67, 68, 69
J. Teesdale	„	72
G. S. Thompson	„	74, 75
W. Youd	„	80, 81
J. W. Balsdon	„	82, 83, 84
T. Parkinson	„	85, 86

PRIZE LIST.

CHAMPION CERTIFICATE FOR BEST GROUP RECORD IN COMPETITION.

Awarded to M. LOVE (Hens Nos. 34, 35 and 36 (Black Orpingtons).

$$\left.\begin{array}{l}\text{1st Grade ... 471}\\ \text{2nd Grade ... 290}\end{array}\right\}\text{761 Eggs} = 689\tfrac{1}{4}\text{ units.}$$

LEADING GROUP PENS.

SECTION "A"—LIGHT BREEDS.

(*a*) J. J. JACKSON (Hens Nos. 34, 35, and 36).

$$\left.\begin{array}{l}\text{1st Grade ... 370}\\ \text{2nd Grade ... 410}\end{array}\right\}\text{780 Eggs} = 677\tfrac{1}{2}\text{ units.}$$

YALDARRA POULTRY FARM (Hens Nos, 1. 2 and 3).

$$\left.\begin{array}{l}\text{1st Grade ... 513}\\ \text{2nd Grade ... 201}\end{array}\right\}\text{714 Eggs} = 663\tfrac{3}{4}\text{ units.}$$

*First Prize, £3 3s.

WALKER & Co (Hens Nos. 67, 68 and 69).

$$\left.\begin{array}{l}\text{1st Grade ... 555}\\ \text{2nd Grade ... 129}\end{array}\right\}\text{684 Eggs} = 651\tfrac{3}{4}\text{ units.}$$

*Second Prize, £2 2s.

* Donated by the late Sir Alfred Langler. (*a*) Ineligible for prizes under Reg. 5.

SECTION "B"—HEAYV BREEDS.

M. LOVE (Hens Nos. 34, 35 and 36).
1st Grade ... 471 }
2nd Grade ... 290 } 761 Eggs = 689¼ units.
*First Prize £3 3s.

T. PARKINSON (Hens Nos. 46, 47 and 48).
1st Grade ... 581 }
2nd Grade ... 106 } 687 Eggs = 660½ units
*Second Prize, £2 2s.

NEAVEDALE POULTRY FARM (Hens Nos. 43, 44 and 45)
1st Grade ... 571 }
2nd Grade ... 99 } 670 Eggs = 645¼ units

* Donated by the late Sir Alfred Langler.

LEADING INDIVIDUAL HENS.

SECTION "A"—LIGHT BREEDS.

J. J. JACKSON (Hen No. 36).
1st Grade ... 253 }
2nd Grade ... 5 } 258 Eggs = 256¾ units
Prize, £1 1s.

YALDARRA POULTRY FARM (Hen No. 3).
1st Grade ... 184 }
2nd Grade ... 82 } 266 Eggs = 245½ units.

J. McALLISTER (Hen No. 41)
1st Grade ... 228 }
2nd Grade ... 18 } 246 Eggs = 241½ units

SECTION "B"—HEAVY BREEDS.

M. LOVE (Hen No. 35).
1st Grade ... 239 }
2nd Grade ... 15 } 254 Eggs = 251 units.
Prize, £1 1s.

G. S. THOMPSON (Hen No. 73).
1st Grade ... 246 }
2nd Grade ... — } 246 Eggs = 246 units.

T. PARKINSON (Hen No. 46).
1st Grade ... 208 }
2nd Grade ... 50 } 258 Eggs = 245½ units.

WINTER TEST FOR HIGHEST TOTAL OF UNITS DURING PERIOD 10TH APRIL—9TH JULY.

GROUP PENS.

SECTION "A"—LIGHT BREEDS.

T. BOULTER (Hens Nos. 7. 8, and 9)—179¼ units.
Prize, £1 1s.

SECTION "B"—HEAVY BREEDS.

PELVAURM POULTRY FARM (Hens Nos. 22, 23 and 24)—211½ units.
Prize, £1 1s.

FINAL DETAILED RESULTS.

SECTION "A"—LIGHT BREEDS—ALL WHITE LEGHORNS.

Competitor.	Hen No.	No. of Eggs laid.			Total Units.		No. of Eggs, 2 oz. and over.	Remarks.
		1st Grade.	2nd Grade.	Total Eggs.	Individual.	Group.		
Yaldarra, P. F. ...	1	132	117	249	219¾	...	120	
	2	197	2	199	198½	...	197	
	3	184	82	266	245½	663¾	168	
Crombie P. ...	4	124	21	145	139¾	...	101	Died 28-2-28.
	5	225	22	247	241½	...	214	P. Certificate.
	6	116	116	232	203	584¼	99	
Boulter, T.	7	176	5	181	179¾	...	146	Died 11-12-27
	8	140	83	223	202¼	...	95	
	9	202	2	204	203½	585½	193	
Davey, G	10	68	190	258	210½	...	88	
	11	109	96	205	181	...	90	
	12	180	9	189	186¾	578¼	161	
Davey, J. W. ...	13	29	159	188	148¼	...	12	
	14	99	76	175	156	...	64	Died 11-12-27.
	15	101	140	241	206	510¼	74	
Durham & Hoops ...	16	187	1	188	187¾	...	184	
	17	209	...	209	209	...	206	P. Certificate.
	18	128	47	175	163¼	560	105	
Pelvaurm, P. F ...	22	212	2	214	213½	...	200	P. Certificate.
	23	167	2	169	168½	...	161	
	24	220	2	222	221½	603½	203	P. Certificate.
Balsdon, J. W. ...	25	142	105	247	220¾	...	112	
	26	93	7	100	98¼	..	79	
	27	87	45	132	120¾	439¾	78	Died 11-12-27.
Haagensen, J. B. ...	28	125	106	231	204½	..	99	
	29	172	...	172	172	...	166	Died 11-12-27.
	30	77	154	231	192½	569	60	
Hepburn, A ...	31	129	11	140	137¼	...	129	
	32	233	3	236	235¼	...	217	P. Certificate
	33	161	8	169	167	539½	153	
Jackson, J. J ...	34	92	156	248	209	...	66	
	35	25	249	274	211¾	...	3	
	36	253	5	258	256¾	677½	234	P. Certificate.
Love, M	37	134	36	170	161	...	116	Died 11-12-27.
	38	219	15	234	230¼	...	211	P. Certificate.
	39	177	5	182	180¾	572	152	Died 11-12-27.
McAllister, J. ...	40	186	33	219	210¾	...	157	
	41	228	18	246	241½	...	208	P. Certificate.
	42	25	224	249	193	644¼	25	
Neavedale, P. F. ..	43	224	1	225	224¾	...	210	P. Certificate.
	44	185	5	190	188¾	...	174	
	45	84	114	198	169½	583	66	
Neavedale, P F. ...	46	138	17	155	150¾	...	120	
	47	167	62	229	213½	...	145	
	48	210	29	239	231¾	596	195	
Parkinson, T ...	49	162	...	162	162	...	162	15-7-27, Replaced dead bird.
	50	235	5	240	238¾	...	229	P. Certificate.
	51	211	11	222	219¼	620	202	P. Certificate.
Partridge, O. J. ...	52	15	172	187	144	...	15	
	53	32	179	211	166¼	...	32	
	54	40	228	268	211	521¼	24	
Priestley, J. ...	55	178	1	179	178¾	...	166	
	56	174	10	184	181½	...	166	
	57	200	...	200	200	560¼	188	
Balgay, P. F. ...	58	184	3	187	186¼	...	179	
	59	169	2	171	170½	...	163	Died 11-12-27.
	60	228	6	234	232½	589¼	214	P. Certificate.
Russell J. W. ..	61	200	7	207	205¼	...	178	
	62	164	83	247	226¼	...	149	
	63	36	44	80	69	500½	36	
Swanson, H. ..	64	65	160	225	185	...	58	
	65	147	20	167	162	...	124	
	66	194	1	195	194¾	541¾	188	
Walker & Co ...	67	179	37	216	206¾	...	156	
	68	153	82	235	214½	...	122	
	69	223	10	233	230½	651¾	212	P. Certificate.
Parkinson, T. ...	70	224	...	224	224	...	222	P. Certificate.
	71	192	3	195	194¼	...	184	
	72	189	...	189	189	607¼	188	
Hanna, S. J. ...	73	109	140	249	214	...	88	
	74	123	73	196	177¾	...	119	
	75	163	4	167	166	557¾	163	

Section "B"—Heavy Breeds.

All Black Orpingtons except pens 19, 20 and 21 and 55, 56 and 57, Rhode Island Reds.

Competitor.	Hen No.	No. of Eggs Laid.			Total Units.		No of Eggs, oz. and over.	Remarks.
		1st Grade.	2nd Grade.	Total Eggs.	Individual	Group.		
Yaldarra, P. F. ...	1	127	72	199	181	...	97	
	2	117	148	265	228	...	90	
	3	175	14	189	185½	594½	156	Died 11-12-27.
Childe, H.	4	39	57	96	81¾	...	22	Died 16-11-27.
	5	199	38	237	227½	...	186	
	6	161	5	166	164¾	474	159	
Collins, A	7	54	11	65	62¼	...	33	Died 11-12-27.
	8	53	28	81	74	...	28	Died 11-12-27.
	9	182	69	201	183¾	320	91	Died 11-12-27.
Davey, G.	10	165	9	174	171¾	...	148	Died 11-12-27.
	11	71	106	177	150½	...	36	Died 11-12-27.
	12	201	45	246	234¾	557	171	
Durham & Hoops ...	13	217	2	219	218½	...	212	P. Certificate.
	14	14	258	272	207½	...	7	
	15	23	157	180	140¾	566¾	3	
Dusting, R. A. ...	16	156	117	273	243¾	...	128	
	17	198	20	218	213	...	177	
	18	183	5	188	186¾	643½	183	
Pelvaurm, P. F. ...	19	170	20	190	185	...	168	
	20	207	33	240	231¾	...	205	P. Certificate.
	21	172	15	187	183¼	600	172	
Pelvaurm, P. F. ...	22	183	11	194	191¼	...	171	Died 11-12-27
	23	172	54	226	212½	...	135	
	24	157	3	160	159¼	563	131	Died 11-12-27.
Hanna, S. J. ...	25	105	165	270	228¾	...	74	
	26	31	175	206	162¼	...	13	
	27	36	237	273	213¾	604¾	22	
Jordan, R.	28	121	...	121	121	...	120	Died 11-12-27.
	29	193	52	245	232	...	171	
	30	207	3	210	209¼	562¼	208	P. Certificate.
Lethridge, A. F. ..	31	152	95	247	223¼	...	115	
	32	66	172	238	195	...	34	
	33	143	20	163	158	576¼	127	Died 11-12-27.
Love, M. . ..	34	35	239	274	214¼	...	...	Died 21-2-28.
	35	239	15	254	251	...	220	P. Certificate.
	36	197	36	233	224	689¼	189	
McDonald, N. ..	37	219	10	229	226½	..	209	P. Certificate.
	38	119	99	218	193¼	...	103	
	39	14	239	253	193¼	613	4	
Neavedale, P. F. .	40	136	26	162	155½	...	99	Died 11-12-27
	41	85	138	223	188½	...	48	
	42	213	...	213	213	557	207	P. Certificate.
Neavedale, P. F. ..	43	209	26	235	228½	...	173	
	44	157	71	228	210¼	...	154	
	45	205	2	207	206½	645¼	195	
Parkinson, T. ..	46	208	50	258	245½	...	167	
	47	220	14	234	230½	...	202	P. Certificate
	48	153	42	195	184½	660½	127	
Pepper, F. B. ...	49	84	80	164	144	..	84	
	50	139	104	243	217	...	124	
	51	183	35	218	209¼	570¼	171	
Riddell, G. C. ...	52	220	4	224	223	...	200	P. Certificate
	53	147	2	149	148½	...	138	
	54	243	...	243	243	614½	238	P. Certificate.
Balgay, P. F. ...	55	94	78	172	152½	...	75	
	56	227	3	230	229¼	...	212	P. Certificate
	57	179	11	190	187¼	569	175	
Balgay, P. F. ..	58	168	1	169	168¾	...	165	
	59	218	1	219	218¾	...	218	P. Certificate
	60	195	9	204	201¾	589¼	169	
Robinson, D. F. ...	61	150	17	167	162¾	...	117	Died 11-12-27.
	62	172	12	184	181	...	167	
	63	205	11	216	213¼	557	194	
Russell, J. W. ...	64	229	3	232	231¼	...	223	P. Certificate.
	65	183	8	191	189	...	176	
	66	172	5	177	175¾	596	155	
Spence, H.	67	97	157	254	214¾	...	62	
	68	124	154	278	239½	...	85	
	69	80	90	170	147½	601¾	50	Died 11-12-27.
Teesdale, J. ...	70	201	58	259	244½	...	178	
	71	102	76	178	159	...	68	
	72	157	59	216	201¼	604¾	118	
Thompson, G. S. ...	73	246	...	246	246	...	237	P. Certificate.
	74	89	150	239	201½	...	84	
	75	136	27	163	156¼	603¾	115	Died 11-12-27.
Vernon, A. E. ...	76	168	77	245	226¼	...	131	
	77	94	154	248	209½	...	88	
	78	197	6	203	201½	637¼	191	
Youd, W.	79	196	47	243	231¼	...	161	
	80	26	146	172	135½	...	15	
	81	148	85	233	211¾	578½	111	
Balsdon, J. W. ...	82	124	90	214	191½	...	92	
	83	100	171	271	228¼	...	67	
	84	81	192	273	225	644¾	43	
Parkinson, T. ...	85	21	161	182	141¾	...	1	
	86	35	197	232	182¾	...	12	
	87	166	19	185	180¼	504¾	143	

Production certificates, awarded by the Department of Agriculture, for birds laying not less than 200 eggs, 2 ozs. and over, were issued to—

14 hens in Section "A," Light breeds;

13 hens in Section "B," Heavy breeds;

as per marginal notes shown against individual scores.

DEATHS DURING THE TERM OF THE COMPETITION.

Bird No.	Breed.	Owner.	Date.	Cause.
49	W.L.	Parkinson, T.	15-7-27	Cystic tumour.
4	W.L.	Crombie, P.	28-2-28	Diphtheric roup (destroyed)
7	W.L.	Boulter, T.	11-12-27	Heat apoplexy
14	W.L	Davey, J. W.	11-12-27	do.
27	W.L.	Balsdon, J. W. ...	11-12-27	do.
29	W.L.	Haagensen, J. B. ...	11-12-27	do
37, 39	W.L.	Love, M.	11-12-27	do.
59	W.L.	Balgay, P. F.	11-12-27	do.
4	B.O.	Childe, H.	16-11-27	Internal haemorrhage
3	B.O.	Yaldarra P. F.	11-12-27	Heat apoplexy
7, 8, 9	B.O.	Collins, A.	11-12-27	do.
10, 11	B.O.	Davey, G.	11-12-27	do.
22, 24	B O.	Pelvaurm P. F.	11-12-27	do.
28	B.O.	Jordan, R.	11-12-27	do.
33	B.O.	Lethbridge, A. F. ...	11-12-27	do.
40	B.O.	Neavedale, P. F. ...	11-12-27	do.
61	B.O.	Robinson, D. F. ...	11-12-27	do.
69	B.O.	Spence, H.	11-12-27	do.
75	B.O.	Thompson, G. S. ...	11-12-27	do.
34	B.O.	Love, M.	21-2-28	Internal haemorrhage.

The general health of the birds throughout the Competition was highly satisfactory and they completed the test in good working condition.

The severe heat wave experienced on 11th December, 1927, was general and was responsible for record losses to poultry farmers generally.

The following Birds laid 2oz. eggs and over within one month of commencement of competition:—

SECTION "A."—LIGHT BREEDS.

Hen No.	Owner.	Eggs.	Hen No.	Owner.	Eggs.
1	Yaldarra P. F. ...	1	39	Love, M.	2
3	Do. ...	3	43	Neavedale P. F. ...	7
5	Crombie P. ...	4	46	Do. ...	1
9	Boulter, T. ...	9	48	Do. ...	1
12	Davey, G.	4	49	Do. ...	5
16	Durham & Hoops	5	50	Parkinson, T. ...	10
17	Do. ...	6	51	Do. ...	8
22	Pelvaurm P. F. ...	1	57	Priestley, J. ...	7
23	Do. ...	7	58	Balgay P. F. ...	6
24	Do. ...	1	59	Do. ...	11
26	Balsdon, J. W. ...	5	60	Do. ...	2
28	Haagensen, J. B. ...	4	62	Russell, J. W. ...	2
29	Do.	12	66	Swanson, H. ...	8
31	Hepburn, A. ...	3	67	Walker & Co. ...	3
32	Do. ...	4	69	Do. ...	13
33	Do. ...	10	70	Parkinson, T. ...	15
36	Jackson, J. J. ...	5	71	Do. ...	9
37	Love, M.	1	72	Do. ...	13
38	Do.	7			

SECTION "B."—HEAVY BREEDS.

Hen. No.	Owner.	Eggs.	Hen No.	Owner.	Eggs.
3	Yaldarra P. F. ...	3	48	Parkinson, T. ...	2
5	Childe, H.	4	50	Pepper, F. B. ...	5
7	Collins, A.	3	51	Do ...	2
10	Davey, G.	7	52	Riddell, G. C. ...	9
22	Pelvaurm P. F. ...	4	54	Do. ...	16
23	Do. ...	1	55*	Balgay P. F. ...	4
24	Do. ...	5	56*	Do. ...	2
29	Jordan, R. ...	6	58	Do. ...	1
30	Do. ...	20	59	Do. ...	17
33	Lethbridge, A. F....	7	60	Do. ...	2
35	Love, M.	2	64	Russell, J. W. ...	6
36	Do. ...	4	66	Do. ...	2
37	McDonald, N. ...	10	70	Teesdale, J. ...	3
42	Neavedale P. F. ...	16	73	Thompson, G. S. ...	2
45	Do. ...	11	75	Do. ...	1
46	Parkinson, T. ...	2	78	Vernon, A. E. ...	1
47	Do. ...	3	87	Parkinson, T. ...	2

* Rhode Island Reds.

TEST AVERAGES.

Eggs 1½ozs. and over.

——	April	May.	June.	July.	August.	Sept.
"A."—Light Breeds ...	10.11	15.75	14.44	16.19	19.88	21.77
"B."—Heavy Breeds ...	10.22	18.95	20.73	20.72	22.33	22.59
For Competition	10 16	17.35	17.58	18.45	21.10	22.18
——	October.	Nov.	Dec	January	Feb.	March
"A."—Light Breeds ...	23.55	21.82	19.84	18.27	17.42	14.06
"B."—Heavy Breeds ...	22.66	18.64	15.61	18.33	15.14	15.25
For Competition	23.10	20.23	17.72	18.30	16.28	14.65

Section Averages—	Per Bird.
Section "A."—Light Breeds	210.8
Section "B."—Heavy Breeds	221.6
For Competition	216.5

FOODSTUFFS CONSUMED.

		£	s.	d.
Wheat	144 bus. at 5/6 per bus.	39	12	0
Pollard	155½ bus. at £9 per ton	14	0	0
Bran	79½ bus. at £8 per ton	6	7	0
Meat Meal ...	8 cwt. at £1 0s. 6d. per cwt. ...	8	4	0
Bonemeal ...	2cwt. 3qrs. 0lbs. at £1 1s. 6d. per cwt.	2	19	1
Shell Grit ...	10cwt. 1qr. 0lb. at 4s. 10½d. per cwt. ...	2	9	11
Epsom Salts ...	40lbs. at 17s. per cwt.	0	6	1
Tobacco Dust ...	3lbs. at 4d. per lb.	0	1	0
Charcoal ...	on premises	...		
Green Feed ...	Average 3cwt. per week	...		
		£73	19	1

Consumed by—
159 birds in 8 months
135 birds in 4 months

Average 151 birds in 12 months = 9/9½ per bird per year
or 2¼d. per bird per week.

AVERAGE WHOLESALE PRICE OF EGGS

	1927					
Month	April	May	June	July	August.	Sept.
	s. d	s d	s d	s d	s d	s d.
Per dozen	2 6	2 11	2 7½	1 10	1 3½	1 3½

	1927			1928.		
Month	October	November	December	January	February.	March
	s d.	s d	s d	s d	s. d	s. d
Per dozen	1 3¾	1 4¾	1 4	1 6½	1 11¼	2 4½

Average for period of Competition—1s 10¼d per dozen.

Foodstuffs Fed their Value and Ratio

		Protein		Carbohydrates		Fats and Oils		Ash	
	lbs	%	lbs	%	lbs	%	lbs	%	lbs
Wheat	8,640	11.37	982.36	72.5	6,264.0	2.93	253.15	1.52	131.32
Pollard	3,110	12.66	393.72	68.62	2,134.08	3.50	108.85	1.86	57.84
Bran	1,590	14.33	227.84	62.41	992.31	4.64	73.77	3.63	57.71
Meat Meal (Wyndham)	896	70.0	627.20			14.86	133.14	5.57	49.90
Bonemeal (M.I.B.)	308	24.3	74.84	3.6	11.08	3.10	9.54	61.70	190.08
	14,544		2,305.96		9,401.47		578.45		486.80

RATIO

$$\frac{578.45 \times 2.25 = 1,301.51 + 9,401.47 = 10,702.98}{2,305.96}$$

1 to 4.64

THE GRADING AND MARKETING OF POTATOES.

W. E. COLLINS,
Potato Inspector.

The business of marketing his potatoes is always uppermost in the mind of the grower, but the average grower has not yet risen to the same plane as our best fruit packers.

On any market day one may witness cases of fruit being passed over the rollers for sale, and where a product of a packer of repute is submitted there is no close inspection, the buyers not even rising from their seats, being properly satisfied that the quality and grade are there; but none the less the bidding quickly soars above the average rates ruling.

The grading of potatoes is quite as important as the grading of fruit.

Putting good potatoes on the top of the bag is an old trick, and it is still common practice to put good ones in the bottom—this to fool the buyer if he opened the bottom instead of the top of the bag. The merchants and dealers get around this by slitting the centre of the bag from top to bottom, so exposing the whole of the contents to view.

Every kind of deception in marketing is poor business, and sooner or later rebounds on those who practice it.

Now that growers have formed associations, potatoes should be graded and marketed under a brand insuring quality. This would in short time cause potatoes carrying this brand to command a premium.

The old excuses that there is little time to grade at harvesting periods, that growers are more or less in the hands of contract diggers, or that it involves too much handling, are not acceptable to the merchants.

It is generally known that the employer of labour in potato work finds it hard to get men to be careful in grading, no matter how strict the instructions, but the merchants still consider the onus is on the grower to send forward well graded samples.

It may not be good business on the part of the average purchasers of supplies for the household, but it is nevertheless true that 75 per cent. of the potatoes consumed by city and town people pass over the counters of the retail storekeepers in stone and half-stone lots.

When one considers that truck-lots have to be broken down to this degree, it is not to be wondered at that merchants require well graded potatoes to give satisfaction and to avoid loss.

How is this grading to be accomplished with a minimum of trouble and expense?

The writer is of the opinion that grading could be carried out simultaneously with the digging.

Experience has taught that the bugbear of digging is the picking up, and if the digger has to go over the ground twice—which he has to do if two grades are to be made—this constitutes to him a double evil, and the majority resort to all manner of subterfuge to evade it.

What grower is there who has not, when having his crop dug, seen careless and indifferent diggers mar his sample by placing in the bags culls and "pig" potatoes? The digger would much rather take less per bag and have one "pick up" only.

If this be so, the difference in the price of digging with one "pick up" only and that of making two grades, would more than pay for the grading.

For instance, we will take an average crop and set nine men to dig. The crop in the ordinary way of digging and the making of two grades is worth, say, 2s. per bag. Growers will find in nearly every instance, that diggers are willing to dig this same crop at 1s. 9d. (possibly less), providing they may make only one "pick up."

Assuming they dig 15 bags per man, or a total of 135 bags for the day, this would mean a saving of £1 13s. 9d.—more than enough to pay for the grading.

The grader or screen—a home-made affair, or one of those to be purchased on the market—would follow three diggers at the time. Taking the centre row, with the rows right and left, the graders would leave the marketable potatoes graded and sewn up in the one row ready for carting, with the culls and pig potatoes put on one side to be further dealt with. On working up close to the first three diggers they would drop back to the next three men, and so on to the next three.

Following the digging in this style throughout the day, it should be quite possible and reasonable for two good men to sew, tally, and grade behind nine diggers in an average crop.

An extension or modification of this plan to suit acreage, crop. etc., would certainly overcome the trouble of grading, to the mutual satisfaction of both grower and merchant.

Replying to the query that will arise as to what shall be done with the waste, these may be re-graded, but only the very best should be retained for possible "round seed" orders, and the balance fed to stock.

It is more profitable to the grower to send forward 4½ tons of graded potatoes than it is to send a 5-ton truck in which there are distributed the extra eight bags of small and inferior potatoes. In the first instance the grower receives the full current market rate, say, £8 per ton, or £36 for his 4½ tons.

In the latter instance there is every chance of the merchant refusing to take delivery. This truck is then auctioned, and in most cases realises £2 per ton less, or £30 only for the five tons. A clear loss of £6 plus eight bags of possible round seed.

Again, should the consignment escape this and be taken into store, the inspectors of the Potato Branch may be called in to adjudicate and assess the wastage from a pick-over, entailing much loss to the grower and no little inconvenience to the merchant.

This is all very unsatisfactory to the industry, and every effort should be made to remedy it. It is at this juncture, when merchants are surfeited with badly graded local potatoes, they turn to the Eastern States and import.

It is to be remembered the market is never too full for good graded lines. Even in glut season with low prices ruling, there is always a ready sale for prime produce. It is the inferior lines that fill and drug the market.

Another point favourable to marketing, and one that cannot be too strongly stressed, is the use of clean, sound bags. Merchants object to their products being contained in unwashed salt and sugar bags. They state that potatoes do not keep well in these, and that it gives them a most unwholesome appearance. Bags, too, should be sound and well sewn if the grower would avoid considerable losses in weight. It is known that potatoes are paid for on weighbridge weights, but it is not so generally known that, firstly, the potatoes have to be discharged from the trucks on to lorries and then taken to the weighbridge for weighing purposes. During the process it is no uncommon sight to witness weakly bags being broken and the contents spilled on the floor of the wagon and on to the ground, there to be trodden on and wasted—a distinct loss to the grower.

Greening of tubers by exposure is another contributing factor to lowering the market value of potatoes, sufficient care not being taken in the selection of good stout bags, with tightly sewn mouths, and removal to a covered place immediately after digging. The spectacle of gaping bags, with the contents greened at the mouths, is of common occurrence, and it is not rare to see the whole of the tubers "greened up" when such has been left standing in the paddocks for a week or so with the covering of chaff-bag consistency.

FRUIT FLY.

(*Ceratitis capitata.*)

TRAPPING OR LURING METHODS.

L. J. NEWMAN, F.E.S.,
Entomologist.

Since the discovery made in Western Australia that kerosene oil had a most remarkable chemotropic reaction on the male of *Ceratitis capitata,* work of a similar nature, against various species of fruit flies in other countries, has been undertaken by entomologists. This has demonstrated that different species of fruit fly show a reaction to various chemical odours. The Queensland fruit fly, for instance, is so affected by citronella oil, but is indifferent to kerosene oil.

The scope of this line of research is gradually widening and its application to other insects and animals is being tested with promising results.

Geraniol, a product of geranium, is being very successfully used in America against the introduced Japanese beetle (*Popillia Japonica*), a pest which has spread rapidly in that country and caused great economic loss. Tests are at present being carried out in various countries with fermented apple juice as a lure for the Codlin Moth. Beer and sugar, smeared on tree trunks, has long been used by moth collectors as a means of luring these insects. The Oriental Peach Moth in New Jersey is being successfully lured by the products of fermentation. Carbon bi-sulphide has been incorporated in trapping lures for blowflies.

This same principle of attraction by odours is also being applied to the trapping of dingoes, rabbits, etc.

It can be claimed that our local discovery of the attraction of kerosene to the fruit fly has opened up the way to research along these lines against fruit flies. Up to date, very little has been published concerning this method of insect control.

Chemotropism is the reaction to stimuli of a chemical nature perceived through the olfactory sense. Inasmuch as odour is undoubtedly the most important factor in the environment of insects the significance of this tropism is evident. The chief objects of animal or plant life are feeding and reproduction, and in the search for food or for the opposite sexes, chemotropism plays a great part. The sexual chemotropism of the Lepidoptera (Moths) has long been noted as a fact by Entomologists. It is, however, in this more recently discovered chemical stimuli, as affecting the search for food or sex, that we find a method of treatment that I consider has untold possibilities in its practical application.

In the same manner as we have the positive chemotropic reaction we also have the negative chemotropic reaction. This is illustrated in the use of coal tar and other products as repellant odours.

Experiments have already shown that the actions of many insects are directed far more by the antennal sense of smell than that of sight. The sense of smell has been proved to be for certain substances remarkably acute, and the influence of particular smells on the actions of insects at certain periods of their lives may be of so strong and constant a nature, as to make it difficult to avoid the conclusion, that by playing upon the olfactory susceptibilities of insects, we may obtain over their movements and actions a very large measure of control.

In the course of experiments to discover an odour that would react on the female ceratitis, the following oils were tested in traps. Kerosene, Tar, Rodium, Clove, Whale, Citronella, Insectol, Geraniol, Palmarosa and Javalon oil.

The evidence forthcoming proved that kerosene oil was the only one that had any attraction worth noting and this only upon the males.

The opinion ventured here is that the luring effect of the Kerosene upon the male fly, is due to the smell given off by this oil approximating the sex odour given off by the female fly.

As it was the female flies we desired to destroy, further experiments were made, in the hope that some attractive substance would be discovered.

To this end, fruit juices, sweetened mixtures incorporated with various poisons were tested.

Amongst this group Orange and Rock Melon juices proved to be most attractive, capturing both males and females. This is undoubtedly a food chemotropism or reaction. Continuing the experiments we eventually discovered that Pollard mixed with water had a most marked attraction for the female fly, but exercised little influence over the male. There is apparently contained in pollard some constituent that is responsible for this remarkable reaction.

We have no definite proof that the female flies are attracted to the males by a sex odour. In fact, there is no knowledge that the male insects give off any sex odour. It suggested therefore that the odour emanating from the pollard-borax mixture is not attractive as a sex stimulus or a food, but rather that it excited within the female a desire for oviposition and thereby lures her. In other words it appears to create the desire in the female to unburden herself of her eggs.

In examining many thousands of females so captured we have been fortified in this belief, by the fact that in all instances, the egg sacks were fully laden.

Whatever the explanation of the phenomenon is, the fact remains that kerosene attracts the males, fruit juices attract both sexes in equal numbers and pollard attracts, in the main, females.

We believe that it is possible to discover the particular stimulus which will fit the specialised receptivities of any insect and use it as an effective decoy. There is undoubtedly room for much experimental and research work along this line, both for the Entomologist and Chemist.

Having discovered the attractiveness of pollard, it was decided after our experience with the kerosene oil, to test this formula thoroughly before making any public statement. Tests were carried out over a period of twelve months and proved it to be most effective. The odour emanating from the pollard when mixed with water, seems to be irresistible. Immediately the lure is placed in the traps, the flies can be seen making towards it from all directions. They are so enticed that after flying to the edge of the vessel, they dive straight into it and are there drowned.

We found that on an average 88 per cent. of the fruit flies captured with pollard lure were fertile females. Many tests with other mixtures and proclaimed lures have been made, but to date, we know of no other that equals it for the capture of this species of fruit fly. It is easily made and is much cheaper than anything else recommended.

Dr. T. B. Ripley, Entomologist to the School of Agriculture, Cedara, Natal, South Africa, states "Your pollard lure is the most effective of all lures tried against Ceratitis in South Africa." Their particular species in Natal is *Ceratitis rosae.*

Tests with the pollard mixture have been made each winter for three years with very convincing results.

Commencing on the 2nd of May, 1926, and continued throughout the winter, spring, and summer to the 3rd week in March, 1927, the final trapping test was made. Four traps were used, two 10oz. lever lid tins and two petrol tins cut to quarter size with marginal edge of one inch. The lure used was composed of 8ozs. pollard, 8ozs. powdered borax, water 1 gallon. The lure was renewed every seven days summer, and every 10 days winter

In the following table is given the total capture in the four traps for each of the 11 months:—

Month.	Males.	Females.	Total.	% Males.	% Females.
May, 1926 ..	896	2,900	3,796	23	77
June	237	2,679	2,916	8	92
July	34	985	1,019	3	97
August ..	2	296	298	.67	99
September ..	—	75	75	—	100
October ..	—	2	2	—	100
November ..	—	—	—	—	—
December ..	10	29	39	25	75
January, 1927	11	50	61	18	82
February ..	60	318	378	15	84
March (3 w'ks only)	62	430	492	12	18
Totals ..	1,312	7,764	9,076	14%	86%

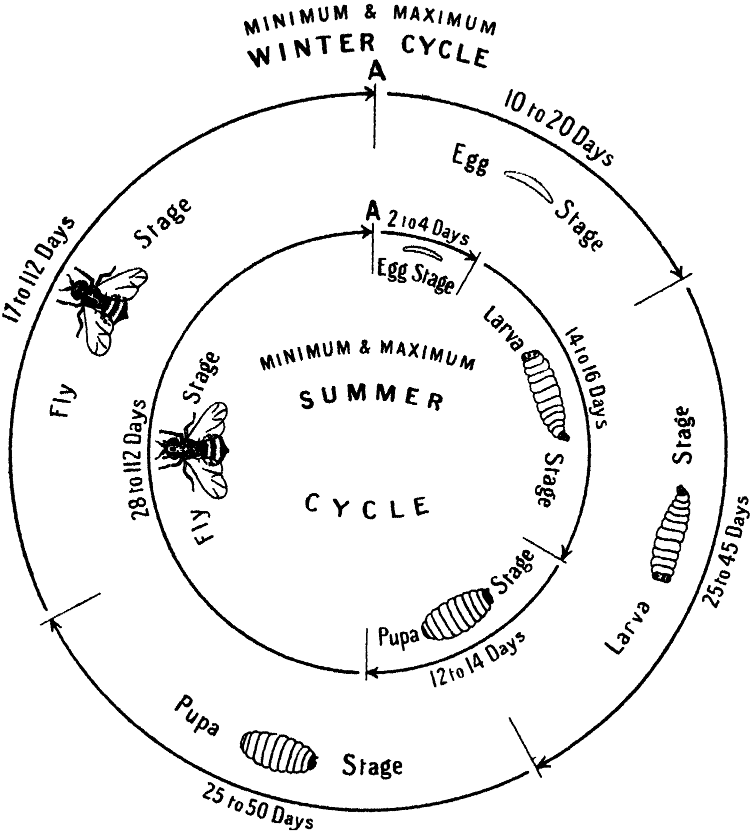
A perusal of this table will disclose a very important fact, namely, the rapid falling away of males as the winter advances. After mid-July, no males were captaured until December. It will be also noted that in August the females rapidly get less, being reduced to two in October, nil in November, again appearing in December.

This has happened each year the tests have been made, and we consider goes to prove that the fly is mainly carried over from May to September by overwintering females. These males and females originate from pupae which produced flies in late May or early June before the ground became too cold and wet.

The males naturally die off earlier than the females. The fact of no flies being captured in October and November would suggest that the trapping had been successful in ridding the garden of all the flies present. The capture in December and onwards to the end of the test indicates an influx of flies from outside areas.

These carry-over flies are attracted to the citrus trees which offer good shelter from wet and windy weather. They also are the only trees carrying fruits during winter. The flies feed upon honey-dew, waxy coatings of the fruits, juice of split or damaged fruits.

If weather conditions in winter are sufficiently bright and warm, egg-laying may be stimulated and a few citrus or loquat fruits be struck. These maggots are naturally slow in their development and will issue as early summer flies. This is another slender thread by means of which the pest is carried over: hence the need for destroying these winter flies.



Diagrammatic Life Cycle (original).

In our more recent experiments it has been demonstrated that the addition of arsenate of soda to the pollard lure enhances its usefulness in two ways. It acts as a further corrective against fermentation and also renders the lure poisonous to any flies that may partake of it and escape capture in the trap.

The lure that is now recommended is made of the following ingredients:—Pollard 8ozs.; powdered borax 8ozs.; arsenate of soda ¼oz.; water to make 1 gallon of liquid.

Method of Making.—Mix the ingredients together thoroughly and allow to steep for 14 to 16 hours. At the end of this period again shake well together and allow to settle.

The heavy matter will fall to the bottom of vessel, leaving a fairly clear amber coloured liquid. Draw or syphon off the liquid discarding the residue which should be buried. By using only the clear fluid, the clogging of the traps is prevented. This preparation, if kept corked, will keep for a considerable period.

The lure should be renewed every seven to ten days in summer and every 12 to 14 days in winter.

Type of Traps to Use.—The efficiency of a fly-trap is greatly improved according to its design. In the large series of experiments undertaken it was found that the main use of the lure was to entice the fly to the trap.

It was soon evident that a trap made of a tin having a smooth edge, captured considerably fewer flies than one having a marginal edge, such as the lever lid tins.

This is accounted for by the eagerness of the fly to get to the lure. In the case of the non-marginal-edged tin, the fly after settling on same will crawl down the sides to the lure.

The wind during this act may cause the trap to sway and the liquid to splash up the sides, thus frightening the fly away.

When the marginal-edged tin is used, the fly does not attempt to crawl down the darkened sides.

Being unable to resist the lure the fly dives straight off the edge into the liquid and is there drowned.

The size of the trap is a factor to be considered. There appears to be little advantage in using large vessels. The few extra flies captured will not repay the cost of the increased amount of lure required to fill the large traps.

In general use it will be found that a marginal-edged tin having a capacity for holding about ¾ of a pint is the most economical and effective size. Whatever the size of the trap, it is necessary to three parts fill with the lure.

Therefore the ¾-pint tin will need 10ozs. or ½ pint of lure each filling.

A deep dark trap only half filled will fail to attract the fly, as it refuses to enter unless the surface of the lure is well lighted.

The colour of the trap is another important factor. A rusty tin is not nearly as effective as a bright one. White is more attractive than black.

The position of the traps in the trees is important. Experiments have shown that when placed about half-way up the tree on the North-East and North-West sides, the best results are obtained.

If fruit is present hang in proximity to same.

In summer (November to March) hang in shade. In winter (April to October) hang in sun.

The minimum number of traps for each tree is two. As many more may be used as the grower finds time to attend to.

In small orchards and home gardens the trapping or luring method is the one that will give the best results. Trapping appeals to most people because it gives great satisfaction to the operator, in that he is able to see and tabulate the capture.

Unfortunately most growers cease to take active measures against the fruit-fly after April. It is here where the great mistake in the efforts to control this pest is made.

After years of observations and trapping experiments it has been proved that the fruit-fly is mainly carried over from summer to summer per medium of over-wintering females.

The figures given in the earlier part of this article clearly demonstrate this fact.

In view of these known facts, it behoves all growers to continue the warfare against this serious fruit scourge throughout the whole year. Trapping or luring should be put into operation whenever the weather condition will permit.

The reduction brought about by the capture of winter and spring flies is proportionately much greater than at a later period when large numbers may be caught, owing to the presence of the insect in plague form.

The important fact to remember is that the flies captured from May to October, although comparatively few in numbers, are the progenitors of the myriads which appear later in the summer.

From May to October is the weak link in the life of this fly under our local climatic conditions.

This is proved by the slight outbreaks which occur here and there in the early summer. As the warm weather comes in, it rapidly assumes, if not controlled, plague form.

In conjunction with the trapping or luring method, it is essential that orchard sanitation be strictly practised. This applies to windfall and infested fruits during all the periods of the year. Infested citrus fruits and loquats, left about the ground during winter, are as great a menace as infested fruits in the warmer periods of the year.

The control of this pest by trapping or luring is possible if all concerned will take concerted action. One neglectful grower in any area may be the means of undoing much of the good work being done by his neighbours.

HORTICULTURAL NOTES.

SEASONAL WORK FOR JULY, AUGUST, AND SEPTEMBER.

GEO. W. WICKENS,
Superintendent of Horticulture.

July.

Growers of apples, pears, and stone fruits will be occupied during this month in pruning and to anyone interested in horticulture, but particularly to those whose livelihood depends upon the quantity and quality of fruit produced, there is no other orchard task throughout the year which is as interesting as pruning. Each year the results of previous year's operations can be noted, past errors corrected as far as possible, and satisfaction felt when the tree is seen to have responded to the treatment given by the skilful operator. I am, of course, referring to pruning which is intelligently performed and where no cut is given without a reason; not to that type of tree disfigurement which sometimes masquerades under the name of pruning, and which mainly comprises indiscriminate cutting back of young growths with an occasional sawing out of a limb; the latter apparently with the idea of imparting a finish to the job.

Anyone who masters the principles underlying the practice of pruning and carefully notes the result of each year's work, will soon become efficient, and not only experience the joy which is always found in work well done, but reap profit as well. Each tree must be treated in such a way that it will produce a maximum quantity of fruit of good quality and marketable size. Leaders must be spaced so as to allow light and air to penetrate freely to every part of the plant, while guarding against over-exposure. In the tree's earlier years care must be taken by moderately hard pruning to force growths from buds along each leader's length and avoid bare spaces so often noticeable, but so unsightly and unprofitable; while in later years equal care must be taken in guarding against overcrowding of bearing buds and shoots which may produce many fruits, few of which are of good quality or marketable size.

Provided the land is not too wet and sticky, July is one of the best months for planting out deciduous trees. Care must be exercised when the young plants are received from the nurseries to carefully heel them in so that the air does not dry the moisture out of the roots. If this is done, the trees will not be injured if planting cannot be proceeded with for a few weeks after the trees arrive.

All growers whose orchards are known by the Department to be infected with San José Scale will have received notice either by registered post or delivered personally, requiring spraying to be carried out once during the winter months, and advising where an orchard is badly infested to spray twice before 7th September. Failure to comply with these instructions renders a grower liable to prosecution and a minimum fine of £5 with a maximum of £100.

Quite apart, however, from the legal penalty attached to non-compliance with the instructions, the grower who fails to spray is acting very foolishly in his own interests, for with efficient winter spraying San José Scale can be kept down to negligible proportions and will hardly be noticeable on the trees or fruit during summer. It has been noted during this and last year's export season that a distinct improvement has taken place over previous years in the quantity of infested fruit turned back at the ports, and if growers will persevere in their efforts efficient control will be secured.

Continue trapping for fruit fly and destroy all oranges and mandarins found to be infested.

August.

Pruning and planting deciduous trees should be completed by the end of this month, and wherever the soil is dry enough, spring ploughing should be in full swing. The second winter spraying for San José Scale should be completed before the 31st on all trees where the buds are forward. Late blooming kinds, like Rome Beauty and Five Crown apples, may be left until about the 7th of September.

Where old apple and pear trees require working over to other varieties, the necessary scions should be secured early in this month from trees thoroughly dormant, and buried in soil in a cool place to retard bursting of the buds.

Orange Aphis will appear about the end of this month and where the insects are sufficiently numerous to damage the young shoots, they should be sprayed with Black Leaf 40 and soap, using 1 lb. Black Leaf 40 and 3 lbs. soap in 80 gallons of water.

Carefully examine ripening loquats for traces of fruit fly and destroy these with any oranges or mandarins found to be infested.

Continue trapping for fruit flies and examine, cleanse and replenish traps as often as required.

September.

This is one of the busiest months for the fruitgrower. Ploughing, cultivating, hoeing, grafting and spraying are the major operations requiring attention and amongst these, one of primary importance, is attention to Pear Scab (*Venturia pirina*). In orchards where this disease is in evidence, it is imperative that the trees should be sprayed with Bordeaux Mixture—6 lbs. Bluestone, 4 lbs. Lime, 50 gallons of water—during the pinking stage of blossoming; that is when the majority of blooms are showing as a pink bud, and when only a few have burst into petals. If this time of spraying is missed, it is difficult to obtain satisfactory results with a number of later sprayings. In many districts in this State in ordinary seasons, the pinking stage spray is all that is required, but when weather conditions are favourable during spring for the development of fungi, a further spraying becomes necessary after the fruit is formed and this time it is advisable to use Lime Sulphur at a strength of 1 lb. Lime Sulphur in 40 gallons of water owing to

Bordeaux Mixture, if applied at that stage having a tendency to russet the fruit. Lime Sulphur should not be used when the sun is bright and the temperature over 75 deg. Choose cloudy cool days if possible.

Continue treatment for Orange Aphis wherever the pest is sufficiently in evidence to damage young shoots and blossoms.

Trap and bait regularly for fruit fly from now onwards throughout the spring and summer in every orchard in infested districts as soon as the various fruits become sufficiently ripe to serve as a depository for the eggs of the female fly. Pick up every 24 hours and destroy all infested fruit.

Complete planting citrus trees this month. Graft over all obsolete varieties of apple and pear trees with varieties which will pay for their upkeep in the orchard, but only do this if the stocks are sound and healthy; an unthrifty stock will never produce a good tree, no matter how well the grafting is done. Use the strap graft and if not familiar with it, ask the Orchard Inspector in your district for a demonstration.

INFLUENCE OF THE BROOD NEST ON SWARMING.

H. WILLOUGHBY LANCE,
Apiculturist.

Sometimes one comes across a beekeeper who says:—"I never disturb the brood chamber. I have not looked at it for two years."

All beekeepers should remember that the brood chamber is the source of all the riches of the hive, and if there is anything wrong there, it will affect the whole work of the colony.

Many little things may go wrong, but there are three important things which need watching. If, on examination in the spring, when other colonies are breeding well, a hive is found with half its breeding cells empty and only patches of brood here and there, although there is honey and pollen in the hive, it means that the queen is not up to the mark; she is either too old or a poor breeder. The hive needs re-queening. Secondly, the brood chamber may be choked with honey, and out of 10 combs only four or five available for breeding; or thirdly, some of the breeding combs may be so old and the cells so small through constant use for breeding (every larva leaves behind a thin skin and thus the size of the cell is gradually reduced) that the queen will not lay in them. Thus, again, the number of available combs may be reduced to four or five.

Either of these conditions will induce early and perhaps frequent swarming. The remedy would be to remove the full or faulty combs and replace with frames fitted with full sheets of foundation.

If upon examination, say, seven or eight out of 10 frames are found to be available for breeding and pollen storing, this may not be sufficient to prevent swarming.

In the spring a good queen is eager to lay worker eggs and build up a large family, that they may fill the storehouse with food for lean months. There is also the natural law of increase of species to be remembered. At this season a good queen will lay anything from 1,000 eggs per day upwards. Under these circumstances, the hive will soon become overcrowded, both with adult bees and hatching brood, and it may be found that all the available brood combs, even up to eight or nine, may be full and that there is no room for the queen to lay more eggs; under these circumstances. the bees will build queen cells in preparation for swarming.

The bee-keepers' policy should now be to cut out any queen cells and give more room by putting on a second storey. Do not simply put this on top, filled with drawn combs or foundation, but take three or four frames of brood and one of honey and pollen out of the original brood chamber and place in the centre of the second storey. Close up the brood in bottom chamber and place empty combs or frames of foundation between the brood and outside combs of honey, or alternate the new frames with the frames of brood, but do not put all the new frames together in the centre. The queen will now probably use both chambers for breeding.

By this method a strong colony will be built up ready to gather surplus when a honey flow starts. As soon as the two chambers are reasonably full, a third storey of full depth or shallow frames may be added for the storage of the surplus honey, which will be the bee-keeper's toll for the trouble he has taken. In a good season, two or even three spare supers may be required for the surplus.

Swarming will be much delayed, and if the beekeeper will examine the brood chamber every week or ten days and cut out queen cells, with a good strain of bee, swarming may be entirely eliminated.

Warning.—All beekeepers are warned to be very careful when purchasing or putting into use any second-hand material or apparatus.

Only recently foul brood was discovered in the apiary of a bee-keeper of long standing and experience. He had never had foul brood or known of it in the neighbourhood, and puts its introduction down to purchasing second-hand hives and frames from another district.

Anyone putting second-hand material into use should thoroughly disinfect same by boiling for 15 minutes or scorching all over, and particularly into joints, with a painter's or plumber's blow lamp.

If intending to purchase same from a person or district about which he knows nothing, the intending purchaser should communicate with the Agricultural Department before closing the deal, as the Department may be able to give him information that may save the beekeeper considerable loss.

FIELD EXPERIMENTS WITH WHEAT AT THE CHAPMAN EXPERIMENT FARM.

I. Thomas, Superintendent of Wheat Farms.
P. Jeffrey, Farm Manager.

In addition to the result of experiments which were published in the March issue of the Journal of Agriculture the following experiments were conducted at the Chapman Experiment Farm during 1927.

With wheat:—Mulching Experiment.
Depth of Ploughing Experiment.
Seasonal Planting Experiment.

The following table shows the monthly rainfall recorded at the farm during 1927 together with the averages over the past 22 years:—

—	Jan.	Feb.	Mar.	Apl.	Growing Period.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
1927 ...	4	10	524	35	261	532	390	277	221	85	1,766	8	94	2,441
Average, 22 years	28	52	49	44	266	428	394	264	170	98	1,580	27	26	1,806

These records show the total rainfall for the year to be 634 points above the average, whilst that for the growing period was 186 in excess of the average. This excess was the reverse of beneficial as some of the land became waterlogged early in the season.

All these experiments were planted on fallowed land which had been ploughed during the winter months of 1926.

MULCHING EXPERIMENT.

The object of this experiment is to determine how far and under what conditions the cultivation of winter fallowed land is profitable during the spring and summer months.

The experiment has been conducted since 1914 and, as in previous years, the following system of cultivation was adopted.

No. 1 Plot was cultivated in spring, after rain in summer and before planting.

No. 2 Plot was cultivated in spring and before planting only.

No. 3 Plot representing neglected fallow was cultivated prior to planting only.

The land on which the experiment was conducted was typical of jam timber country and had been ploughed to a depth of four inches with a mouldboard plough.

At planting time it was noticed that on the neglected fallow plots and also, to a lesser degree, the plots which received the spring and autumn cultivation only, the ground had become set and an even seed bed was not obtained.

The results are as hereunder:—

MULCHING EXPERIMENT.

GRAIN YIELDS.

Variety, " Nabawa." Seed, 45lbs. per acre. Superphosphate 100lbs. Planted 23rd May, 1927.

Treatment.	Computed Yields per Acre.						Percentage, 1927.	Percentage, 1914-27.
	Sec. 1.	Sec. 2	Sec. 3.	Sec. 4.	Sec. 5.	Average.		
	bus. lbs	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	%	%
Cultivated in spring, after summer rains before planting only	20 48	20 0	20 32	20 0	19 4	20 5	143	112
Cultivated in spring and before planting only	15 44	15 28	14 8	12 48	13 36	14 27	100	100
Cultivated before planting only	15 12	14 56	12 16	11 44	10 56	13 1	93	90

HAY YIELDS.

Treatment.	Computed Yields per Acre.				Percentage, 1927.	Percentage, 1914–27.
	Sec. 1.	Sec. 2.	Sec. 3.	Average.		
	C. Q. L.	C. Q. L.	C. Q. L.	C. Q. L.	%	%
Cultivated in spring, after summer rains and before planting	25 1 12	21 1 20	16 0 16	20 3 25	133	108
Cultivated in spring and before planting	19 1 4	15 1 12	12 2 8	15 2 26	100	100
Cultivated before planting only	17 0 8	12 1 4	10 1 4	13 0 24	82	83

The springtyne cultivator was used for all subsequent cultivations and during the fallowing period sheep were depastured at frequent intervals on the whole paddock in which the experiment was conducted. Consequently there was little or no weed growth.

The results obtained this year from this experiment are undoubtedly in favour of the spring and summer cultivated plot. At planting time this plot was in better condition, having a well prepared tilth and an even seed bed, with the result that a better and more even germination was obtained than that on the plots which had not received the same amount of cultivation. To a lesser degree this also applied to the comparison of Plot No. 2 with Plot No. 3.

These results demonstrate the necessity for cultivating the fallowed land after heavy rain during the fallowed period and so preventing it from becoming hard and set and less difficult to obtain the desired seed bed and tilth at planting time.

PLOUGHING EXPERIMENT.

This experiment was conducted on typical jam timber country ploughed in June, 1926, with a mouldboard plough. During the second week in September it was disced to a depth of two or three inches, fallowed a week later by the springtyne cultivator. Owing to vigorous weed growth the land was again disc cultivated about the middle of April and again early in May. Immediately before drilling it was springtyne cultivated, thus securing a good even tilth free from weeds.

The experiment is designed to determine the comparative effects upon resulting crops of ploughing at different depths.

Three different depths of ploughing were utilised for the experiment:—

Plot 1.	Four inches	representing	shallow ploughing.
Plot 2.	Six ,,	,,	medium ,,
Plot 3.	Eight ,,	,,	deep ,,

These three plots constituted a section which was repeated to enable five such sections being harvested for grain and three for hay.

The experiment was planted on the 17th May at the rate of 45 lbs. seed with an application of 112 lbs. superphosphate. The results obtained are shown hereunder:—

PLOUGHING EXPERIMENT.

GRAIN

Variety, "Nabawa"

	Computed Yields per Acre					Average Yield per acre. 1927	Percentage, 1927	Percentage, 1915-27
	Sec 1	Sec 2.	Sec. 3.	Sec 4	Sec 5			
	bus lbs	bus. lbs	bus. lbs	bus. lbs	bus lbs	bus, lbs	%	%
4ins .	17 36	16 56	16 56	16 56	17 44	17 14	99	102
6ins .	18 0	16 24	17 12	17 28	17 52	17 23	100	100
8ins. .	17 52	16 8	16 0	18 16	16 32	16 58	97	104

HAY

	Computed Yield per Acre			Average Yield per acre, 1927.	Percentage, 1927.	Percentage, 1915–27.
	Section 1	Section 2.	Section 3			
	cwt qrs lbs	cwt qrs. lbs.	cwt. qrs lbs.	cwt. qrs. lbs	%	%
4ins. .. .	15 3 2	16 3 17	19 0 3	17 0 26	98	99
6ins	17 0 0	16 3 14	19 0 11	17 2 18	100	100
8ins. ..	15 0 25	16 3 14	19 0 8	17 0 6	97	103

These results, which are almost equal. confirm the conclusion derived from those of previous years, namely that the depth of four inches is sufficient for ploughing this class of country when fallowing. Although no injurious effects appear to result from ploughing jam country to a greater depth than four inches, yet the practice of deep ploughing has not proved itself to be advantageous and is consequently not economical.

SEASONAL PLANTING EXPERIMENT.

The preparation of the land for this experiment was commenced in July and August, 1926, by ploughing to a depth of four inches. During September it was disc cultivated, and the following month Springtyne cultivated to eradicate weed growth. Prior to seeding the land was again disc cultivated and harrowed. The plots planted in May and June received an extra cultivation immediately before being seeded. The result of these operations was the production of a good seed bed and covering tilth.

Three plantings were made, one each April, May and June respectively, the objects being—

April.

(a) To determine whether any variety when planted in April is more prolific than the principal variety, "Nabawa," planted in May:

(b) To determine the variety most suitable for planting in April

May.

To determine the variety, whether late, midseason, or early, most suitable for the principal planting in May.

June.

(a) To determine whether any variety when planted in June is more prolific than the principal variety, "Nabawa," planted in May;

(b) To determine the variety most suitable for planting in June.

The results of the three plantings are as shown hereunder:—

APRIL PLANTING

GRAIN YIELDS

Planted 20th April, 1927. Seed, 45lbs. per acre Superphosphate, 100lbs. per acre.

Date of Planting.	Variety	Maturity	Computed Yields per Acre										Average Yield.	
			Sec. 1		Sec. 2		Sec. 3		Sec. 4		Sec. 5.			
			bus	lbs	bus	lbs	bus	lbs.	bus	lbs.	bus.	lbs.	bus.	lbs
	*Yandilla King	Late .	8	24	8	16	7	4	7	20	8	24	7	54
May 18th 1927	Nabawa (Control)	Midseason .	18	16	14	32	16	16	15	20	11	28	15	11
	Baroota Wonder Early	Late-midseason	13	12	14	8	11	44	12	0	14	24	13	6
	Nabawa ..	Midseason .	9	4	9	4	8	40	9	4	9	44	9	7
May 18th, 1927	Nabawa (Control)	Midseason ..	18	40	17	4	16	0	13	20	15	12	16	3
	Gallipoli ..	Late-midseason	9	4	8	24	8	56	9	36	12	40	9	44
	Gluyas Early	Early	12	40	12	16	10	16	12	48	12	56	12	11
May 18th, 1927	Nabawa (Control)	Midseason .	16	56	16	32	13	36	12	48	11	28	14	16
	Canberra ..	Early .	16	56	16	32	15	20	17	12	17	36	16	43

* Affected by rust.

MAY PLANTING

GRAIN YIELDS

Planted 20th May, 1927. Seed, 45lbs per acre. Superphosphate, 100lbs. per acre.

Variety.	Maturity	Computed Yields per Acre.										Average Yield.	
		Sec. 1.		Sec. 2		Sec. 3		Sec. 4		Sec. 5.			
		bus.	lbs	bus.	lbs	bus.	lbs	bus.	lbs.	bus.	lbs.	bus.	lbs.
*Yandilla King ..	Late .. .	6	32	5	52	6	0	4	40	4	16	5	28
Nabawa (Control)	Midseason ...	12	0	12	40	13	28	12	16	12	0	12	29
Baroota Wonder Early	Late midseason	14	56	17	44	18	48	16	56	16	32	16	50
Gallipoli	Late midseason	10	8	12	16	12	48	10	8	10	16	11	7
Nabawa (Control)	Midseason ..	11	20	12	8	10	16	10	56	11	20	11	12
Gresley	Early	15	12	18	48	16	48	15	44	16	48	16	40
Canberra	Early	17	12	20	16	18	0	16	56	19	20	18	21
Nabawa (Control)	Midseason ..	13	4	13	20	12	8	12	24	13	4	12	48
Carrabin	Early	10	8	10	24	11	20	11	36	10	8	10	43
Comeback ...	Early	14	32	16	32	16	24	13	28	14	16	15	2
Nabawa (Control)	Midseason ...	13	12	15	12	13	36	13	28	13	52	13	52
Merredin	Early	15	12	16	16	15	20	14	32	16	8	15	50
S. H. J.	Very Early ...	14	24	16	8	12	48	13	12	13	52	14	5
Nabawa (Control)	Midseason ..	13	4	14	8	12	8	13	28	13	36	13	17
Noongaar	Very Early ...	12	0	12	24	12	0	11	52	11	44	12	0

* Affected by rust.

JUNE PLANTING.

GRAIN YIELDS.

Planted 22nd June, 1927. Seed, 45lbs. per acre. Superphosphate, 100lbs. per acre.

Date of Planting.	Variety.	Maturity.	Computed Yields per Acre.										Average Yield.	
			Sec. 1.		Sec. 2.		Sec. 3.		Sec. 4.		Sec. 5.			
			bus.	lbs.	bus.	lbs.	bus.	lbs.	bus.	lbs.	bus	lbs.	bus.	lbs.
	Nabawa ...	Midseason ...	12	56	14	40	18	24	18	40	14	8	15	45
May 20th, 1927	Nabawa (control)	Midseason ...	17	36	22	56	25	4	22	40	18	48	21	25
	Carrabin ...	Early ...	15	20	15	4	17	20	16	8	13	20	15	26
	Gluyas Early	Early ...	16	0	18	40	16	56	16	56	14	56	16	42
May 20th,	Nabawa (Control)	Midseason ...	17	4	25	36	23	4	20	48	19	12	21	9
	Canberra ...	Early ...	13	12	14	40	13	4	13	28	11	20	13	9
	Merredin ...	Early ...	14	56	16	24	12	40	14	24	10	16	13	44
May 20th, 1927	Nabawa (Control)	Midseason ...	19	36	23	28	22	56	19	28	18	0	20	41
	Gresley ...	Early ...	15	12	14	24	12	56	15	44	12	0	14	3
	S. H. J. ..	Very Early ...	16	32	15	12	11	[illegible]	17	20	13	12	14	43
	Nabawa (Control)	Midseason ...	23	44	22	8	22	0	22	8	20	8	22	2
	Noongaar ...	Very Early ..	11	12	10	24	10	56	10	16	9	28	10	27

The results of the above experiment, which are for one year only, show no definite indication that the generally accepted advantage gained by planting the later, rather than the earlier maturing varieties in April, and *vice versa* in June, is correct. They, however, do indicate that the month of May is the most suitable month to plant all varieties, and that when necessary to extend the planting season it is better to seed in April rather than in June.

It is well when perusing these results to remember that the past season was not favourable for the development of the disease "Septoria," which would be expected to affect the earlier maturing varieties planted in April.

It is believed that the failure of the late varieties planted in April was due to a large extent to the fact that, owing to their slowness in getting away, the weeds had a chance, to get a hold and dominated the situation. This was very evident in the "Yandilla King," "Nabawa" (April) and "Gallipoli," whereas those varieties which got away quickly from the ground, such as "Gluyas Early" and "Canberra," and even the "Baroota Wonder" did not suffer in the same way. This, however, is more a reason for planting later with a better chance of controlling the weeds, than for planting the early varieties early, and trying to choke the weed growth. The "Yandilla King" also suffered considerably from rust, this disease accounting for the very low yields obtained.

The early varieties yielded better than the later ones planted in June, but "Noongaar," a very early variety, was evidently much too quickly maturing for the conditions at this farm.

POTATO FERTILISER TRIALS ON BLACKBOY FLATS AT YOUNG'S SIDING.

G. N. LOWE,
Senior Potato Inspector.

In view of the large acreage of blackboy country in the Southern area of Western Australia, more particularly along the Albany-Denmark line, trials which have been conducted by the Department should prove of general interest. These trials were carried out in 1927 and 1928 on typical blackboy country at Young's Siding. The weather during the 1927 experiment was very wet, and very dry weather prevailed throughout the season of 1928. In spite of the adverse weather conditions and a slight infection of Rhizoctonia an average yield of 6 tons 17 cwt. 2 qrs. was obtained—a satisfactory result, since the trials conducted by the Department were primarily concerned with the suitability of this type of country for potato growing. Further experiments will be carried out by the Department to obtain suggestions for the manuring of this type of country.

Potato Fertiliser Trials on Blackboy Flats at Young's Siding.

The trials were conducted on the property of Mr. E. W. Ovenall, of Young's Siding. The soil was that of typical blackboy country, low lying, wet and sandy. The flats were well drained and thoroughly cultivated. Mr. Ovenall supplied the seed from crops grown in hill country. This seed was from a strain of Delaware potatoes which had been selected very carefully over a period of years, and was planted at the rate of about 10 cwts. per acre. The whole of the fertilisers were applied in the furrows at the time of planting.

Variations in the quantities of phosphoric acid, nitrogen and potash were made by using varying weights of super, sulphate of ammonia and sulphate of potash per acre. These weights were compared against a stan-

POTATO FERTILISER TRIALS ON BLACKBOY FLATS AT YOUNG'S SIDING—JAN.-MAY, 1928.

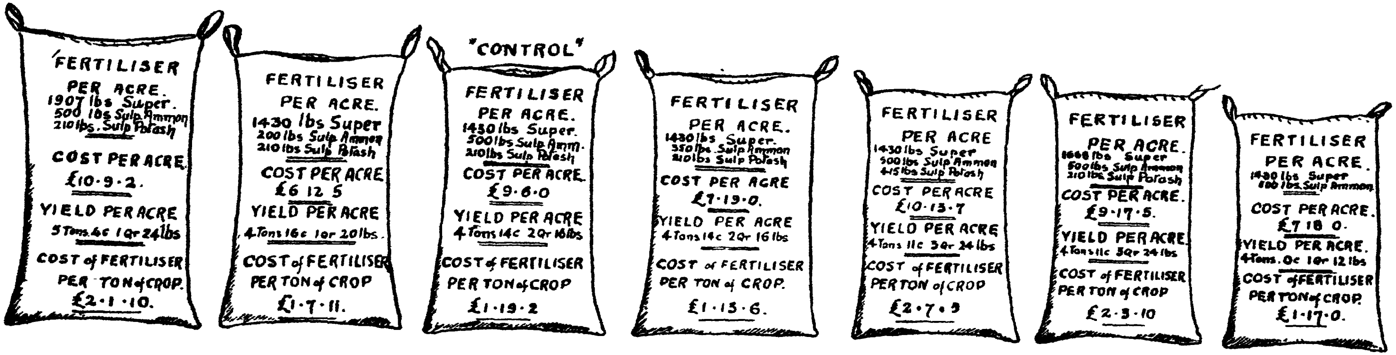
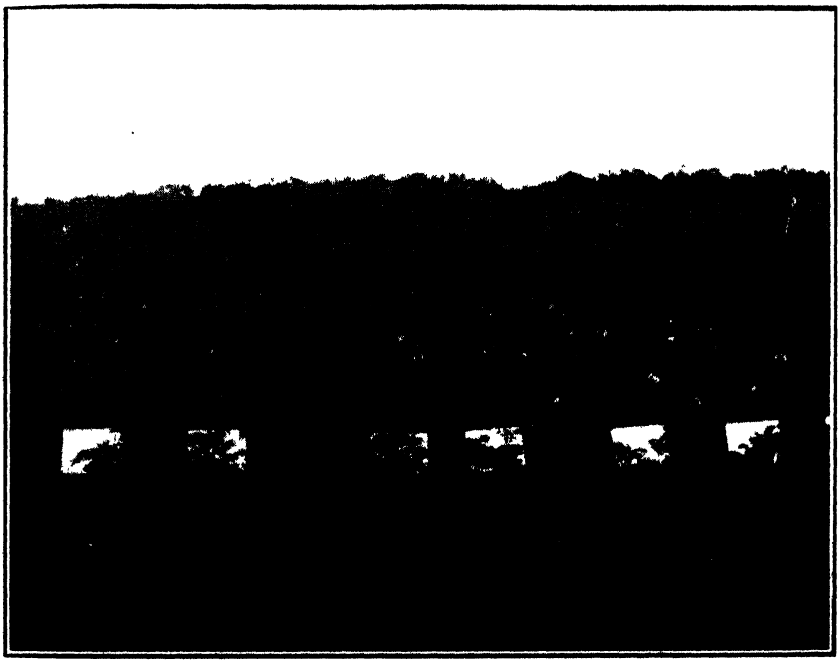


Chart showing Composition and Weight of Application per acre of Fertiliser, the Cost and Computed Yields, and also the Cost of Fertiliser per ton of Crop.

dard control mixture. This standard control mixture, which was used simply as a basis of comparison, was 1,430 lbs. super, 500 lbs. sulphate of ammonia, and 210 lbs. sulphate of potash per acre. It has an analysis of 14 per cent. phosphoric acid, 5 per cent. nitrogen, and 5 per cent. potash, and costs approximately £9 6s. per ton. The variations were made by altering one component only and leaving the rest of the mixture constant.

A reference to the chart of the 1928 trials will show that the highest yield was obtained from a mixture containing 1,907 lbs. super, 500 lbs. sulphate of ammonia, and 210 lbs. sulphate of potash. This mixture gave 9 cwt. 3 qrs. 8 lbs. per acre more than that of the standard control mixture. If we assume that the price of potatoes is £6 per ton this means an increase of £3 per acre for an expenditure of about 23/-. It was also noticed that there was a much higher percentage of "ware" over that of "small" and "pig" potatoes in the plots with the largest weight of super per acre. Results from the 1927 trials confirmed that an increase of super above 1,430 lbs. per acre is economically sound. Further experiments are necessary to find out how much super can be applied so that the margin of profit derived by the increased manuring is more than the extra cost of the manure. The increased yield derived from the higher application of super may be due to the influence of the phosphoric acid in the super, or to the mechanical effect of the bulk of the manure in the soil. Though a higher yield was obtained by the use of 1,907 lbs. super in the mixture, yet experiments throughout the country have indicated that 1,430 lbs. super is about the right amount for potato growing in Western Australia, but continued experimental work is necessary to determine this, of course.



The experiment when coming into bloom.

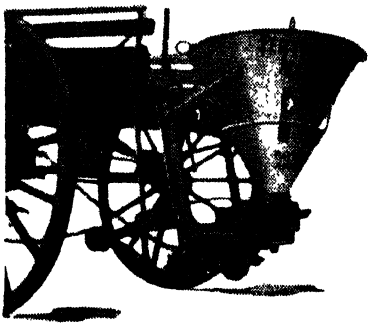
In the case of the nitrogen series there was no large increase in yield as a result of increasing the weight of sulphate of ammonia from 200 to 500 lbs. per acre. The land used for these experiments was virgin ground, and it is more than probable that as the land is worked a higher rate of manuring with sulphate of ammonia will be necessary. Actually the highest yield in the series was obtained by the lowest weight of sulphate of ammonia, viz., 200 lbs. (See chart.) The difference, however, between the highest and lowest yield was only about 1½ cwt. per acre. A very similar result was obtained in 1927, when the lowest weight of sulphate of ammonia gave the best return. The growing period of the Delaware is so short that it is possible that too much sulphate of ammonia may cause excessive foliation.

It was definitely established that potash is essential in this type of land. The return from the plots treated with a non-potash manure was 11 cwt. 2 qrs. 12 lbs. per acre lower than any other of the plots. On the other hand there was no difference in yield obtained by using 415 lbs. per acre as against 210 lbs.

Summary.

1. Potatoes can be profitably grown on blackboy flats.
2. It would seem that a successful manure for such country is 1,430 lbs. super, 200 lbs. sulphate of ammonia, and 210 lbs. sulphate of potash.

May Bros. Patent Broadcast



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2—4

ELEPHANT GRASS.

(*Pennisetum purpureum.* Schum.)

G. K. BARON-HAY and C. A. GARDNER.

Description of Plant.

A tall perennial grass with a creeping rhizome, culms erect, in tufts of up to 20, 6 to 10 or more feet in height, branched, terete glabrous, smooth excepting the uppermost internode, which is more or less hairy to tomentose in the upper part. Nodes mostly exserted from the sheaths, all glabrous, or some of them with a ring of stiff long adpressed hairs. Leaf sheaths terete, clasping the stem, striate; ligule a narrow rim bearing a dense fringe of white hairs; blades linear, very long, tapering upwards 1 to 3 feet long, with a strong midrib. Flowers in a dense cylindrical spike from 4 to 12 inches long, usually yellow or tinged with brown, purple, or black-purple, composed of deciduous spikelets or bundles of spikelets, each spikelet or bundle surrounded by an involucre of numerous bristles minutely scabrid and slightly plumose towards the base, unequal, 1.2-2 or up to 4 cms. long. Spikelets sessile, or if in bundles of 2 to 4, the lateral pedicelled, or lanceolate, more or less acuminate, 5-7 mm. long, glabrous, green or straw-coloured, or tinged with brown or purple towards the tips of the florets, rarely dark purple throughout, hermaphrodite or, if fascicled the lateral male, rarely all neuter or all male. Lower glume rudimentary or suppressed, upper ovate to ovate-lanceolate, acute 0.5-1 mm. long, subhyaline, 1-nerved or nerveless. Lower floret male, or more often barren; the glume lanceolate, acute or acuminate, usually as long as the upper floret, more or less distinctly 3-nerved, rarely 1 or 5 or even 7-nerved; palea linear-lanceolate, 2-nerved, shorter than the glume. Upper floret hermaphrodite, or in the lateral spikelets male, flowering glume lanceolate, acuminate, minutely roughened upwards, usually 5-nerved at least in the upper part; palea narrow linear-lanceolate, slightly shorter than the flowering glume, apex minutely 2-toothed. Lodicules O. Anthers 2.5-3 m.m. long, tips very minutely penicillate. Styles united all along; stigmas very slender, up to 4 m.m. long, exserted from the tip of the floret. Grain obovoid-rhomboidal, yellow, smooth and shining, abruptly tapering into the style.

The species is a native of tropical Africa, where it has a very wide range between 10 degrees N. Lat. and 20 degrees S. Lat. The northern limit runs from Sierra Leone through the great equatorial forest zone to the Cameroons, thence to the Nile, Lake Victoria and British East Africa. The southern limits run through Angola to Katanga, thence across the middle Zambesi to Eastern Rhodesia as far east as Beira. Within this immense area it occurs principally along watercourses and in marshy depressions, but occurs also in the well-lighted forest areas. It often forms reed jungles. In the drier savannahs of East Africa it is rarely more than 6 feet high.

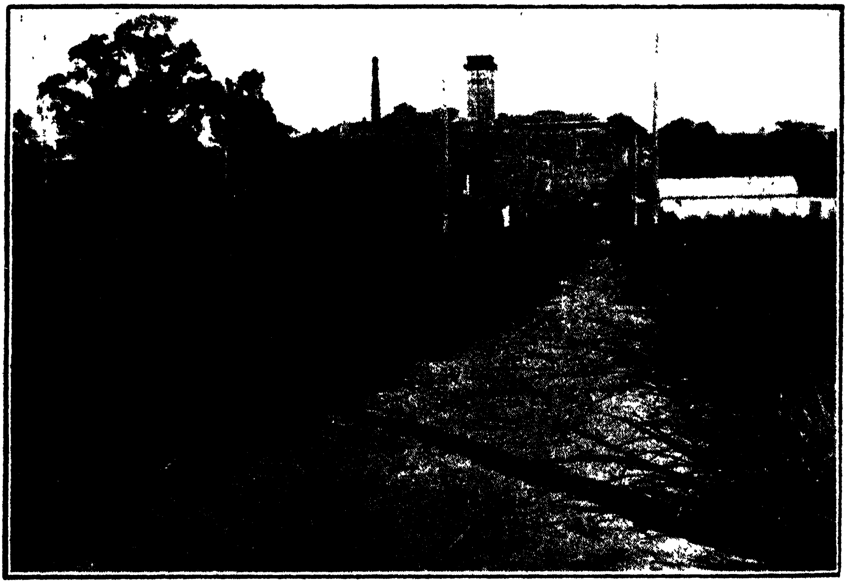
In Western Australia, under drier conditions than in its native habitat, 6-8 feet is considered a good growth.

The grass has been under notice in Africa since 1905, and is considered one of the best fodder grasses there, where it has been tested under severe conditions for some years.

Elephant Grass was probably introduced into Australia in 1914 by the Department of Agriculture, New South Wales, which obtained a parcel of seed in that year. Only one seed germinated, the resulting plant becoming the origin of the grass in that State.

Elephant grass, as far as can be ascertained, was introduced into Western Australia in 1916 by Mr. Alex Crawford, then Chief Inspector of Rabbits, Department of Agriculture, who obtained a small packet of seed from Rhodesia. It is a coincidence that, in this sample of seed also, as in that obtained by the New South Wales Department of Agriculture, only one seed germinated, and from the resulting plant supplies have been distributed over Western Australia.

Several cuttings were grown by Mr. Catton Grasby in 1917, and some idea of the rapidity with which the plant multiplies can be gained from the fact that Mr. Grasby distributed no less than 4,000 cuttings in the spring of 1918, to farmers in various districts of the State.



Elephant Grass at Claremont Hospital for the Insane. One month's growth after cutting, 1928.

Habits.

Elephant Grass (*Pennisetum purpureum*) is a coarse grass when mature, and is characterised by extremely rapid growth under moist and warm conditions. It grows in clumps which stool prolifically, and is thus usually planted in rows from 4-6 feet between plants.

Mature leaves which attain a length of 2-2½ feet are coarse, but, when the plant is grazed or cut, the young shoots, until the plant reaches a height of 3 feet, are soft, succulent and relished by stock.

There appears to have been several distinct strains evolved, differing in such characters as hairiness of leaf and stem, height at maturity, etc.

The common variety has large broad leaves, and flowers at from 7-8 feet. A finer variety, noticed by Mr. W. M. Carne, Botanist and Plant Pathologist, matures at a height of 6 feet and has finer leaves than the common variety. Mr. O. Bowles, Waroona, has 5 acres of this fine variety, which he states gives more rapid growth in the summer months. It is intended to test these two varieties together, for yield, palatability, etc., during the coming summer.

Elephant Grass has not been known to form viable seed in the temperate portions of the State, *i.e.*, South of Geraldton, though in its native habitat seed is commonly produced.

Seed obtained by Mr. P. G. Hampshire, however, and grown by Mr. E. Angelo, M.L.A., Leura Farm, Carnarvon, in 1923, gave a good percentage of germination, namely 47%, which compares favourably with the percentage of germination found in good quality samples of Rhodes Grass seed (40%) and paspalum dilatatum (35%). It would seem possible, therefore, that should seed be required supplies can be drawn from the North-West of this State.

Fine variety grown by F. Coyle, Peel Estate, on light sandy soil. Note flowering heads at height of 4 to 6 feet.

Suitable Climatic Conditions.

Elephant Grass is extremely drought resistant, but, being a heat loving plant, only thrives during the summer months. Those districts, therefore, where no summer rains occur, or where moist ground is not available, are not likely to suit it.

The grass prefers a deep, well drained loamy soil, with plenty of moisture, but has shown itself capable of growing on a variety of poorer sandy soils, under dry conditions.

Where irrigation is possible, excellent results have been obtained on the deep coastal sands as at the Claremont Hospital for Insane (see illustration).

This plant also has demonstrated its ability of growing on the jarrah and she-oak hills found in the extreme South-West, typically from Narrikup to Denmark, including Albany. These hills are of a sandy nature, either lying on solid coffee rock (a form of laterite) or studded with "floating" masses of this rock, on which soils very disappointing results have been obtained with the more common and better class pasture grasses and clovers.

Good results also have been reported on the lighter soils surrounding swamps on the Peel Estate and at Bullsbrook, which retain some moisture during the summer months.

Elephant Grass will not stand hot dry winds, and is, therefore, hardly worth a trial in the Wheat Belt.

Tall coarse variety, grown on sandy loam at Bullsbrook. Photo. taken 18 months after planting, and having been cut three times.

Cultivation.

As seed is difficult to procure, propagation is carried out from roots or cuttings.

Roots or young rooted plants are preferable to cuttings, as growth is more rapid, failure to strike very rare, and a cut can be obtained 10-12 weeks after being first planted, if sufficient moisture is available.

A single plant will produce as many as 40-50 young rooted stems in one season.

Rooted plants may be planted at any time of the year, if the soil is moist, but cuttings should only be planted in the spring.

Cuttings should be taken from the hard portions of the stem, and have three joints. Those taken from the softer upper portions of the stem often rot in the soil.

Rooted plants or cuttings should be planted on cultivated ground which has been ploughed to a depth of 5-7 inches and well cultivated.

Where large areas are to be planted, the cuttings may be dropped in shallow furrows, 3 inches deep, and the earth ploughed back on to them. Small areas may be "dibbled" in, leaving one node (joint) exposed.

Superphosphate at the rate of 2 cwt. per acre should be applied at planting, and a subsequent top dressing with 1 cwt. per acre each spring.

At the Hospital for Insane, it has been found beneficial to thoroughly cultivate the planted area in autumn after feeding off, and again in spring before growth commences.

Elephant Grass on sandy loam at Redmond, near Albany, grown by Mr. J. H. McGoff.

Value as a Fodder Plant.

Where moisture is present, heavy yields of Elephant Grass are obtained, and as many as four cuttings in one season have been secured.

At the Hospital for Insane, Claremont, an average of 3 cuts are obtained, yielding approximately 20 tons in the aggregate per acre. This fodder is held in high esteem by the manager (Mr. J. Kerr) as a factor in milk production during the summer months.

Mr. F. Coyle, Peel Estate, has a small area growing on moist sandy soil, from which he states he obtained four cuttings during the summer of 1926-27.

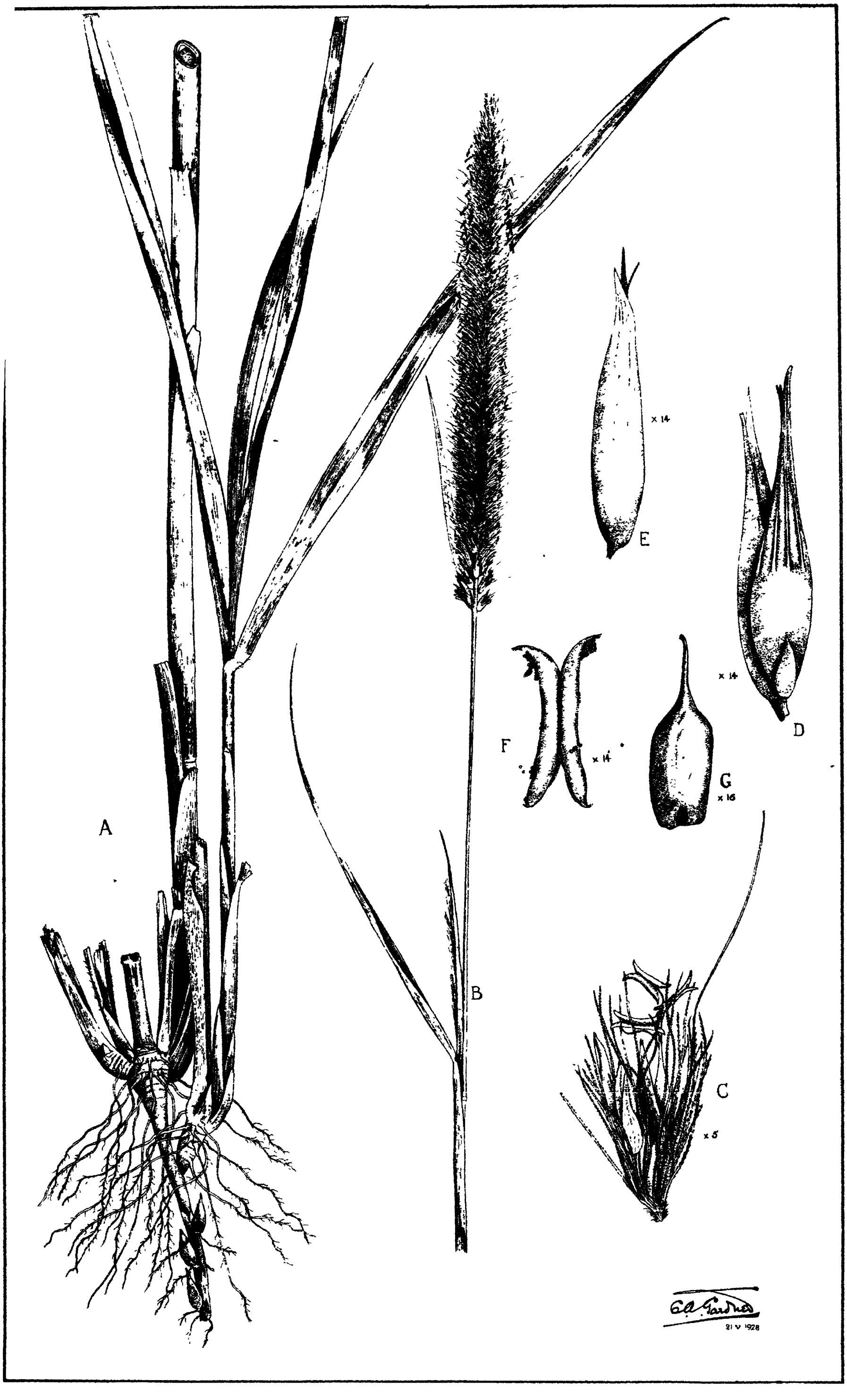
If not allowed to mature and become fibrous, Elephant Grass is highly relished by stock, particularly cattle and horses. Analyses show that the nutritive value of the grass is high, figures for Sudan Grass and maize are given for comparison.

	Water.	Crude Protein.	Fat.	Carbohydrates.	Indig. Fibre.	Ash.
Elephant Grass (N.S.W.) ...	63·82	3·25	0·41	15·71	14·01	2·80
Sudan Grass	63·9	2·0	1·1	21·5	8·4	3·1
Maize, Green	76·9	1·9	0 6	13·9	5·5	1·2

Little attention has been paid to this valuable fodder plant, but its capacity for thriving on poor soils, such as the sandy jarrah and she-oak hills around Albany, semi-swamp sandy land along the coastal region, as at Bullsbrook, coupled with its undoubted value as a nutritive fodder, renders it worthy of more attention from farmers in the South-West portions of the State.

Explanation of Plate.

A. Habit of plant, half natural size; B. Flowering spike, half natural size; C. Bundle of spikelets taken from base of spike; D. Upper floret, with second glume in front, and lower floret behind; E. Lower floret, with tip of upper floret protruding from behind; F. Dehiscing anther showing pollen; G. Grain.



ELEPHANT GRASS. (Pennisetum purpureum, Schum.) PERTH, W.A. 1928.

PASTRY.

By M. A. WYLIE.
Inspectress and Organiser Domestic Science Classes,
Education Department.

Pastry, in savoury dishes, sweets and dessert gives variety, and with care and judicious preparation, may add to the nutritive value of the every-day menu.

There are four varieties of pastry as used by the housewife, viz.—Short, flaky, rough puff and puff, and certain general rules may be applied to each. First and foremost, materials should be of the best quality, the proportions exactly measured: materials and utensils clean and cool and the work done under the coolest conditions possible. Handling should be light and quick, and the oven for baking should be dry, hot and quick.

The difference in types of pastry consists in the varying proportions of fat to flour. This fact will be seen in dealing with the ingredients of the different types. It is essential to remember that self raising flour or rising material should never be used if the exact proportions of flour and fat be adhered to, as the fat, when heated thoroughly produces a gas, which acts as a rising agent. The heating process also breaks, simultaneously, the starch cells of the flour, enabling it to absorb the fat globules as soon as they are liberated through the action of the heat. Thus it will be seen, that if the oven be not hot enough, the pastry is liable to become sodden and indigestible, because the flour is not ready to absorb the fat, which is often seen to escape. Another golden adage to remember, "Use as little water as possible with pastry." When rolling out pastry, use short, even strokes—using but little additional flour, which spoils the required proportion; cut edges lengthwise to allow the heat to penetrate and assist in obtaining lightness. If cooking tarts without fillings, prick well with skewer or fork to prevent puffing in the centre. Custard tarts often present difficulties—as the paste is liable to absorb the custard and become sodden. To obviate this, brush the pastry with white of egg before putting in the custard. The glazing used for pastry for savoury dishes is yolk of egg, or the entire egg well beaten, or milk; for sweet dishes, a glazing mixture of sugar and water is used, or a sprinkling of sugar before serving. Apple pies should not be decorated, except for an edge serrated or crimped; meat pies, on the other hand, may be decorated with fancy designs; Cornish pasties should be raised high and the edges neatly frilled. Closed pies or tartlets require the edges to be slightly damped before joining.

Different Pastries:—*Short Pastry* is used for fruit pies, mince patties, lemon tarts, Cornish pasties, currant rolls, etc., and is made as follows:—

Ingredients:—

½lb. flour.
¼lb. butter, dripping or lard.
Cold water.
Pinch of salt.

***Method*:—**

(1) Sift flour and salt.
(2) Add fat (shortening), and rub in with tips of fingers until resembling bread crumbs.
(3) Add a little cold water and mix to a stiff dough, using a knife.
(4) Turn dough on to board or slab, lightly floured—roll once without folding. Cut into shape. Cut edges like leaves of a book.
(5) Cook in hot oven.

For rich, short pastry, one or two extra ozs. of fat, a yolk of egg, and ½ teaspoonful of lemon juice may be used. This pastry keeps well.

Flaky Pastry is used for sausage rolls, lemon cheese cakes, apple pie, beefsteak pie, etc.

Ingredients:—

½lb. flour.
3ozs. lard.
3ozs. butter.
Pinch of salt.
Very cold water.
½ Teaspoonful of lemon juice.

Method:—

(1) Sift flour and salt.
(2) Add ¼ of the shortening, rubbing in with finger tips.
(3) Add lemon juice and sufficient cold water to mix to stiff dough.
(4) Turn on to a floured board—toss into a ball.
(5) Roll thinly to an oblong.
(6) Spread ¼ of the shortening in small lumps over ⅔ of strip. Sprinkle lightly with flour—fold in three, press edges together—turn top edge to right.
(7) Repeat this process till all shortening is used. Fold and roll twice more.
(8) Cut to required shape.
(9) Glaze and bake in hot oven.

Rough-puff Pastry is often used for sausage rolls, cream horns, oyster patties, etc., instead of flaky or puff paste.

***Ingredients*:—**

½lb. flour.
3ozs. butter.
3ozs. lard.
½ teaspoonful lemon juice.
Cold water.
Pinch of salt.

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West Australian Oranges
West Australian Almonds
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Method:—

(1) Sift flour and salt.
(2) Cut lard and butter into pieces the size of walnut.
(3) Add to flour without breaking the lumps.
(4) Add lemon juice and sufficient cold water to mix to stiff dough.
(5) Turn on to board or slab, lightly floured.
(6) Roll out very thinly, lengthways.
(7) Fold in three; press edges together to imprison air. Turn top edge to right and roll with short, quick rolls to and from—not from side to side.
(8) Repeat rolling and folding, four or five times.
(9) Cut into shape and bake in hot oven.

Puff Pastry is used for richer varieties of dishes.

Ingredients:—

½lb. of flour.
½lb. butter (very firm).
Yolk of egg.
Teaspoonful of lemon juice.
Very cold water.

Method:—

(1) Sift flour (twice).
(2) Make stiff paste without butter, stirring in yolk of egg, lemon juice and water. Knead till smooth.
(3) Roll out into an oblong—slightly flattened.
(4) Prepare butter with two butter pats, squeezing out any water, into one solid oblong pat.
(5) Place in centre of paste—fold paste over into three.
(6) Press edges together.
(7) Turn half way round, top to right hand side—make 3 dents with rolling pin, groove fashion—roll out lengthways as thinly and evenly as possible.
(8) Fold in three, bringing top edge downwards, and bottom edge up.
(9) Press edges together (as in rough puff).
(10) Repeat folding, rolling and turning six or seven times.
(11) Between 3rd and 4th rolling and 5th and 6th rolling, the pastry is improved by allowing it to rest on slab in ice chest if possible, for 20 minutes.

Note: Care should be taken during the folding to enclose as much air as possible. This is done by placing the hand in between the layers before pressing edges. Avoid breaking any air bubbles.

N.B.—All pastry is improved by being allowed to remain in a cool spot before baking. It pays to let Puff Pastry remain over night. This, of course, applies to pastry only before fillings, etc., are used.

The meat for meat pies, if cooked before, must be either very cold, or very hot when covered with the pastry. This is also applicable to fruit for fruit pies.

LIVE STOCK AND MEAT.

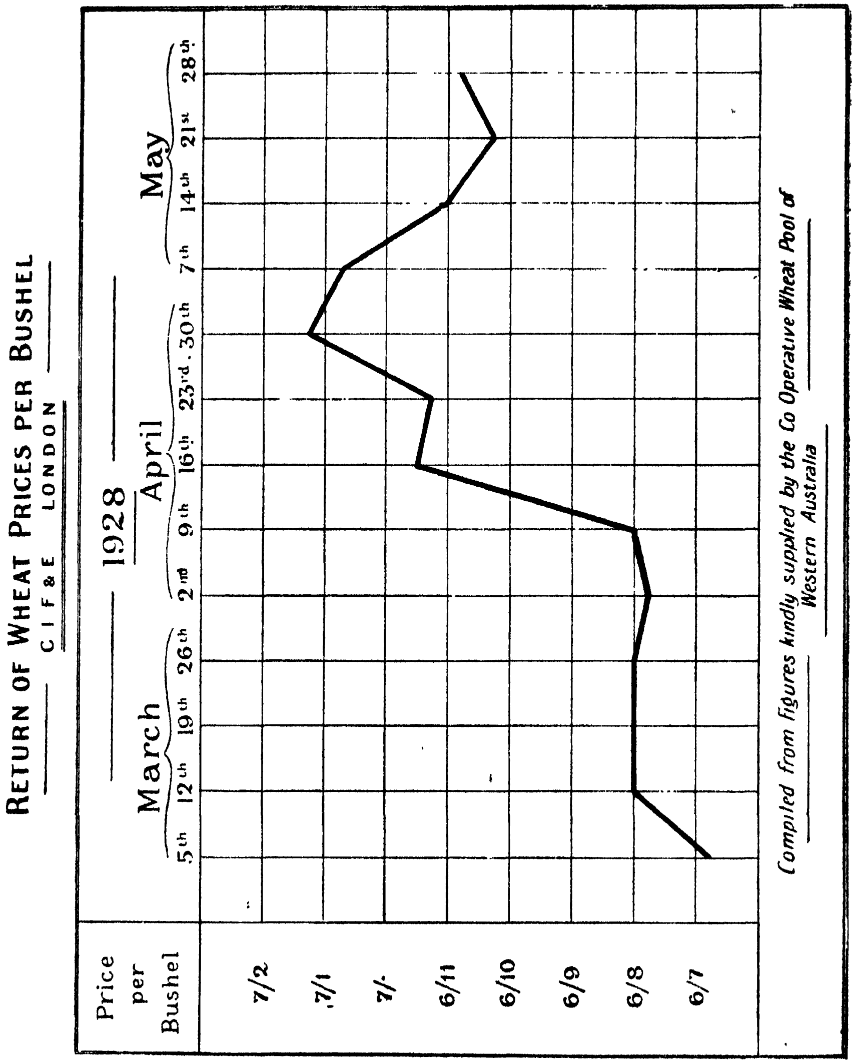
For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK YARDED AT METROPOLITAN FAT STOCK MARKETS FOR MONTHS OF MARCH, APRIL, AND MAY, 1928.

—	MARCH, 1928.				APRIL, 1928.				MAY, 1928.				
	7.	14.	21.	28.	4.	11.	18.	24.	2.	9.	16.	23.	30.
Sheep & Lambs	8,544	8,261	11,150	11,221	7,709	6,597	7,790	8,687	11,691	9,610	9,833	11,458	9,262
Cattle ...	802	586	604	643	671	581	756	691	887	549	909	704	792
Pigs ...	970	720	939	781	920	540	692	470	929	1,004	796	745	552

COMPARATIVE VALUES PER LB. OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS DURING THE MONTHS OF MARCH, APRIL, AND MAY, 1928.

—	MARCH, 1928.				APRIL, 1928.				MAY, 1928.				
	7.	14.	21.	28.	4.	11.	18.	25	2.	9.	16.	23.	30.
Mutton	7¼	8¼	8	7¾	8¼	9	9½	10	11	10½	10½	10	10½
Beef ...	6	6½	8	8½	8½	7½	6½	6½	7	8	7½	7½	7½
Pork ...	11½	11¾	11½	11½	11¾	11¾	12	12	11¾	11¾	11¾	12	11¾
Bacon ...	9¼	9¼	8½	9¼	9¼	9¼	9½	9½	9½	9½	9½	9½	9½


RETURN OF WHEAT PRICES PER BUSHEL
C I F & E LONDON
1928
March
April
May
5th
12th
19th
26th
2nd
9th
16th
23rd
30th
7th
14th
21st
28th
Price per Bushel
7/2
7/1
7/-
6/11
6/10
6/9
6/8
6/7
Compiled from figures kindly supplied by the Co Operative Wheat Pool of Western Australia

MARKET REPORT.

The following particulars of the approximate quantity of chaff available for auction at the metropolitan chaff and grain sales held in Perth during the months of March, April, and May, also the minimum and maximum prices ruling for f.a.q. to prime wheaten, have been supplied by Messrs H. J. Wigmore & Co., Ltd., of Wellington Street, Perth:—

March—Quantity—1,500 tons.
Maximum price—£5 5s. per ton.
Minimum price—£5 per ton.
April—Quantity—800 tons.
Maximum price—£5 12s. 6d. per ton.
Minimum price—£5 5s. per ton.
May—Quantity—1,000 tons.
Maximum price—£6 per ton.
Minimum price—£5 10s. per ton.

It will be seen from the above that good supplies were coming forward in March, and with little incentive for buyers to purchase more than their normal requirements, the market was very dull. However, towards the end of April, owing to the absence of rain, buyers were more inclined to operate, and with rather light yardings available, the market gradually firmed. Beneficial rains have now fallen, and should the season progress satisfactorily, better prices cannot be hoped for, and farmers having a surplus to market would be well advised to steadily consign.

Oaten Chaff.—A noticeable feature of this market has been the extreme scarcity of supplies arriving on the market, and right throughout the period under review, oaten chaff of good qualty has realised prices equal to best wheaten, in fact prime green samples have been worth as much as 5s. per ton more than prime wheaten.

Oats.—During March the market for good heavy feeds remained steady at from 3s. to 3s. 3d. per bushel, but in April and May, owing chiefly to the dry spell, large quantities were used for sheep feeding, and growers generally did not feel inclined to market their surplus. Values consequently firmed, good heavy feed samples, suitable for grading, selling in May as high as 4s. 6d. per bushel. Since the rains have fallen, growers are more inclined to market, and an easier feeling prevails. Nevertheless, there is a fair inquiry for good heavy feeds at from 4s. to 4s. 2d., mediums 3s. 8d. to 3s. 9d.

Wheat.—The market is steady, f.a.q. selling at auction at from 5s. 9d. to 5s. 10d. per bushel, inferior being in demand at lower prices according to sample. Farmers would be well advised to consign their surplus seed to auction, a good market being assured.

METEOROLOGICAL INFORMATION.

STATIONS.	TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	MARCH, 1928.						APRIL, 1928.						MAY, 1928.					
					inches.	inches.					inches	inches.					inches.	inches.
Chapman State Farm	86·7	101·0	60·8	44·1	·49	·52	82·9	101·0	57·0	48·3	·35	·46	75·5	94·8	51·3	40·1	3·15	2·27
Geraldton	81·8	98·8	64·6	52·4	·49	·46	78·8	97·0	60·0	51·2	·50	·84	75·4	90·8	56·5	39·0	2·91	2·79
Walebing	84·5	102·4	57·3	47·8	·29	·77	80·5	100·0	51·9	42·8	·35	·80	72·1	93·0	47·1	30·1	1·97	2·52
Perth	79·8	98·5	59·8	52·3	·10	·81	76·9	95·9	57·4	48·4	·89	1·65	71·1	89·0	51·9	41·0	5·08	4·97
Kalamunda	81·2	98·3	58·8	48·0	·14	·94	77·3	96·0	56·5	48·1	1·06	1·98	69·9	90·8	52·5	43·0	4·85	5·95
Bunbury	76·7	92·2	56·2	48·0	·23	1·04	72·5	89·2	52·8	46·0	1·18	1·75	67·6	79·9	49·4	37·0	5·01	5·31
Bridgetown	82·3	95·0	51·2	41·0	·17	1·06	73·9	95·0	47·5	34·5	2·67	1·67	67·8	82·5	39·8	32·0	3·96	4·56
Albany	71·9	92·4	57·3	46·0	·41	1·58	70·1	94·6	56·0	48·4	4·00	2·71	66·0	82·6	49·8	39·0	5·58	5·03
Merredin State Farm	83·0	98·2	58·4	45·6	1·01	1·01	78·5	97·0	52·3	42·4	·58	·77	68·9	86·0	45·5	32·0	·76	1·25
Northam	85·4	100·5	57·7	48·6	·38	·74	81·3	99·0	52·0	41·0	·28	·81	...	Not	received	...	2·09	2·20
York	85·1	101·0	57·1	43·0	·19	·66	80·1	98·2	50·6	38·8	·36	·83	71·6	91·0	42·4	32·0	1·50	2·32
Narrogin State Farm	81·9	93·8	53·0	44·5	·20	·82	76·8	94·2	50·7	41·1	1·64	1·07	67·0	83·6	44·5	30·0	2·86	2·76
Katanning	80·2	90·6	54·6	43·3	·01	1·00	74·5	93·7	51·2	39·0	1·94	1·17	66·4	83·2	43·8	34·0	1·89	2·28
Cape Leeuwin ...	72·5	85·0	61·5	54·0	·46	1·29	69·8	92·0	60·3	52·0	3·39	2·11	66·9	77·2	56·0	41·5	5·33	5·64

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No. 83.—*Horticulture and Viticulture.* By A. Despeissis. Price 2s.
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PERTINENT TOPICS.

G. L. SUTTON,
Director of Agriculture.

"CLOVER SICKNESS."

"Clover sickness" is a term which at one time was conveniently used to describe the failure of clover to grow from any cause, but particularly when the failure occurred on land on which it had previously been grown successfully. In Europe clover of some kind is so fundamental in order to maintain fertility that the total or partial failure of the clover crop is a matter of vital concern to European agriculturists. The problems associated with "clover sickness" were, in consequence, of intense interest some years ago, and remained so until the cause was determined, and consequently the remedy indicated.

In experiments conducted at Rothamstead with this trouble it was found at first that the "clover sickness" was not as bad on plots treated with Phosphatic and Potassic fertilisers as on those treated with other kinds of manure, and it was considered that the trouble was probably due to a deficiency of these mineral constituents of the plant, and especially of potash. Subsequent trials, however, showed that this tentative conclusion was not the correct one, and though there would be clover failures on land where potash or phosphoric acid was in deficient supply, yet failure also occurred where adequate supplies of these were not lacking.

Some kinds of "clover sickness" have been found to be due to the presence of parasitic organisms, but not all kinds, and now it is generally recognised that "clover sicknes" is due to one or more conditions set up by, and consequent upon, the growth of clover on the same land continuously for a number of years.

The clover crop is not unique in that its yield declines after successive crops have been harvested. Most cultivated crops are affected in the same way. It has become obvious that the growing of any crop continuously, renders the land on which it is grown less suitable for that crop. This lesson was learnt early in connection with some crops, particularly the grain crops, and hence the age-borne lesson that a change in cropping is essential for best results.

When it was realised that clover in common with cereals and other crops also had to have a change, the remedy for "clover sickness" was obvious and at hand. In some places turnips were introduced economically and with success as a change crop after clover. In consequence turnips were said by some to be a cure for "clover sickness." The turnips, however, were only the means to the end. The real remedy was the change of crop, as this gave the land an opportunity to recover from the condition which it had reached as the result of a continuous growth of clover. Fortunately, as did the turnip crop in the case referred to, many other crops will serve the same purpose. In all parts of the Western Australian clover belt it may not be possible to economically grow turnips, and it would, therefore, be an unsound practice to include them in the farming practice as a change crop, and as a remedy for "clover sickness" if it occurred in Western Australia. The oat crop is equally as suitable as turnips for the purpose, as are also rape and barley. It is known that the oat crop is an economic one for our clover country, and it is believed that for many years this will be the main change crop in that part of the State.

As far as I am aware there have not been any cases of "clover sickness" reported amongst the Subterranean Clover crops in the South-West of this State. It is difficult to realise that this trouble will occur on arable land where the clover is treated largely as a crop which, like oats, occupies the land for a restricted, but longer period of several years, and after which the clover sod is broken up to give place to other crops. Provided the clover grown in this way is treated with liberal dressings of superphosphate, or other suitable phosphatic fertiliser, it is not likely to suffer from a deficiency of either phosphoric acid or lime, but as the years go on, and the clover crops are removed by grazing, or as hay, it is expected that it will be necessary to supplement the phosphatic fertilisers with those containing potash. As is very generally known the clover, once established, is not likely to suffer from nitrogen deficiency, and, in consequence, to need the application of nitrogenous fertilisers. The clover plant, in common with other leguminosae, has the power of obtaining from the air sufficient supplies of nitrogen for its own needs, and then, in its residues, leaving in the soil sufficient for the needs of other crops.

Owing to the comparatively recent introduction of Subterranean Clover into our agriculture, and consequent lack of definite information on the point, it is very much more difficult to forecast what is likely to happen to Subterranean Clover when used as a permanent pasture on other than arable land. It seems possible, and at present there is no evidence to the contrary, that under Western Australian conditions it will prove eminently successful in this role, provided its natural enemies can be kept in check, and provided it is suitably fertilised. At the present time this latter requirement involves periodical top-dressing with phosphatic manures, and in the future it may be found that potassic fertilisers are also necessary. This latter point is one that can be determined only by experiment. In this connection the Hon. Minister for Agriculture is desirous that farmers, who are interested in this matter, should co-operate with the Superintendent of Dairying and his staff to obtain the necessary information. He has provided facilities whereby the necessary trials can be carried out on the farmers' holdings.

THE CONTINUED USE OF SUPERPHOSPHATE IN THE CLOVER BELT.

There are some farmers in the clover belt who believe that the continued application of superphosphate is likely to cause the soil to become more acidic, as the result of the depletion of its lime contents. There is, however, no foundation for such a belief. (Lime is a compound of calcium, and, as understood by the farmer, is usually either calcium oxide (quick lime) or calcium carbonate (slaked lime or chalk), the latter form is most commonly applied to the soil at the rate of not less than about ten hundred weight per acre.) Though plants require a small amount of calcium as food, and can obtain it from the lime applied to the soil, lime is not applied to the soil for this purpose, but mainly with the object of correcting acidity or sourness when such is sufficiently pronounced as to prevent the crop making its best growth.

Superphosphate does not contain calcium oxide or calcium carbonate and, therefore, when applied to the soil does not add these calcium compounds to it. Superphosphate, however, contains two other calcium compounds, namely calcium sulphate and calcium phosphate, and from these compounds, contained in the superphosphate, the calcium which the plant needs as food can be obtained just as it can also be obtained from the lime which may be applied to correct acidity.

Superphosphate, however, being an acid fertiliser, does react with some of the carbonate of lime in the soil, but though many experiments have been conducted elsewhere in connection with this matter, there is no evidence to show that the continued application of superphosphate results in making the soil appreciably more acidic.

Farmers in the clover belt and elsewhere may, therefore, continue using superphosphate without fear that their soils will become more acidic because of its continued use, and also with confidence that the calcium compounds in the superphosphate will furnish the calcium needed by the plant for a food.

THE TWO ESSENTIALS FOR MAKING GOOD SILAGE.

The time is at hand when silos are to be filled in readiness for the coming summer. The first essential to ensure success is to cut the crop at the right time. Experiments have shown that the proper time is when the material contains from 66 per cent. to 74 per cent. of moisture. Farmers cannot be expected to determine the moisture content of their crops by analytical methods, nor is it advisable nor needful that they should do so, for the degree of maturity of the cultivated crops is an excellent practical guide as to the amount of moisture they usually contain, and with the latitude of from 66 per cent. to 74 per cent. such a guide may be regarded as quite satisfactory. With the winter cereals—wheats, oats and barley—commonly grown in this State, the period of full bloom is the proper time to cut them, and with maize or "Indian corn" it is when the kernels are dented and well towards maturity. Experience with the general condition of these crops at the proper stage of maturity will indicate to the farmer the best time to harvest other crops or plants for the same purpose.

The worst kinds of silage are obtained from the following extreme conditions, viz.:—(a) when the crop is over-ripe or from over-dry material, (b) when the material is immature or excessively wet. These extremes should be avoided and the material must be succulent, but should not be so succulent that the juices will be pressed from them to drain away on being pressed in the silo or stack.

In selecting the stage at which the green stuff is to be cut for silage, it is better to err—if at all—on the side of succulence rather than on that of extreme dryness, for in such cases, provided the crop is not immature, the worst that will happen will be that some of the juices will be pressed out and the food material contained in them lost, but the silage will still be good.

If for any reason the crop becomes too mature or becomes wilted after being cut and before being placed in the silo, its condition and the quality of the resulting silage can be improved by sprinkling the material with water as it is being chaffed and placed in the silo.

The second essential for success is to keep the material during the process of ensilage at a comparatively low temperature—not much above 120 deg. Fahr. This condition is assured by *the exclusion of air*, and the necessity for ensuring this constitutes the *"Golden Rule"* in connection with the making of silage.

At one time the winter cereals were regarded as unsuitable because their stems were hollow and therefore contained large quantities of air, compared with the stems of maize and sorghum, which are solid. These opinions have proved to be ill-founded, for the anticipated difficulties have been overcome, and the exclusion and absence of air facilitated by chaffing, packing, and pressing the greenstuff. Except in the uppermost layers the pressure is provided, in tower silos, by the weight of the material in the silo itself. To ensure the proper packing of the greenstuff, it is important to see that the heavy and light material is evenly distributed throughout the mass, so as to avoid having all the weighty portions in the centre and the light portions—leaves, etc.—on the outside. The proper packing is further aided by tramping the material as it is filled into the silo, and usually is done by one or more persons. More attention is generally paid to tramping the edges rather than the centre. This, it is believed is a mistake, for if the material in the centre is less compact than at the edges it is likely to sink more, with the resulting tendency to draw the material away from the sides, thus admitting air between the walls and the material, and resulting in waste on the outside. The endeavour should therefore be to tramp the surface evenly, but, if anything, less vigorously at the edges than in the centre.

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BROOM MILLET COMPETITION.

G. K. BARON-HAY, B.Sc.Agr.,
Assistant Superintendent of Dairying.

Last season the W.A. Brushware Company, Fremantle, generously donated a prize of £5 for the best 1cwt. of Broom Millet fibre received at their factory prior to 30th April. The samples of fibre received demonstrated clearly that prime hurl could be produced in this State. In order, therefore, to further encourage growers in the production of this crop, the management of the factory decided to continue the competition for this season under the same conditions.

Although the past season was most unfavourable to the production of good fibre, some excellent samples were received. The following are the results of the competition:—

–	Quality of Fibre.	Colour of Fibre.	Freedom from Weeds.	Length of Stalks.	Packing.	Total.
Maximum	20	10	10	5	5	50
E. E. Manning, Kelmscott	20	10	10	5	5	50
Cartwright Bros., Wagerup	18	18	9	5	5	45

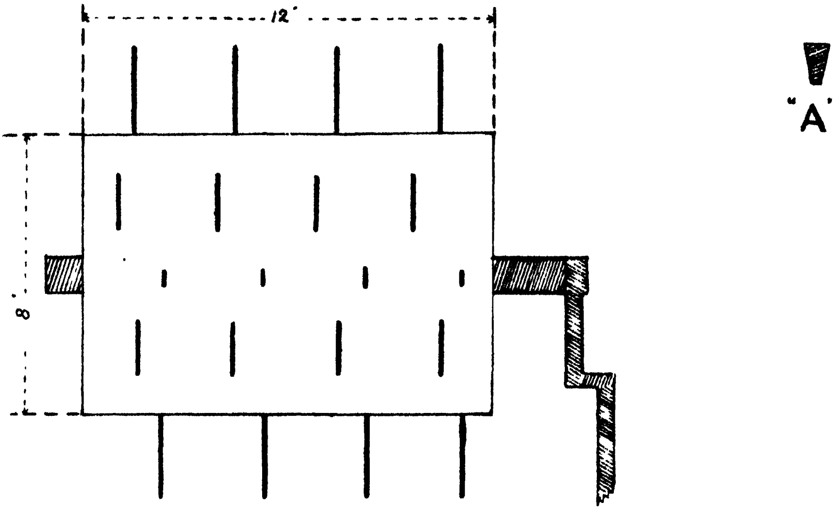
Good samples of fibre were also received from the following growers, though not packed to fulfil the requirements of the competition:—J. M. Riegert, Yarloop; John Grayson, Wagerup; O. E. Titley, Brunswick Junction; and R. Waring, Group 81, Peel Estate.

The winning sample of fibre was prime quality hurl, of good length and colour, and had been very carefully prepared. A consignment of such a sample would sell at a premium of £12 to £13 per ton on the market.

Messrs. Cartright's sample was also of good fibre, though was stained at the tips, probably due to lying in too large heaps before the seed had been removed, which caused sweating.

The price of fibre has ranged from £39 to £50 per ton this season, at which price good returns per acre may be obtained.

All growers interviewed by the writer have complained that it is tedious work removing the seed from the broom heads. Provided the heads are well dried, the seed may be removed very easily by means of a roller, studded with ⅛in. iron studs, either with blunt edges or round. Sharp edges will tear the fibre. The studs should be arranged in rows, three inches apart, and staggered in the rows so that no one nail comes immediately behind the other, as in a tyne cultivator. The roller can be driven by a treadle. (See illustration.)



ROLLER FOR CLEANING SEED

Studs 3 ins
Eight rows, 3 ins' between studs
"A". Section through stud, showing blunt edge (Enlarged)

Illustration.—Full details as to cultivation are given in the Departmental *Bulletin* No. 201, obtainable by application to the Director of Agriculture, Department of Agriculture, Perth.

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A FATAL DISEASE IN SHEEP.

J. F. FILMER, B.V.Sc.

Inquiries are frequently received (especially during late summer and early winter months) concerning a fatal disease in sheep, which occurs throughout the Wheat Belt and Great Southern Districts. It frequently affects sheep in good condition, but is not confined to these. There is nothing very characteristic about the symptoms; but on opening the sheep the body cavity is found to contain a large quantity of fluid. This is generally the only abnormality noticed by the farmer though usually changes in the liver are present. It is thought that the following short summary of the way in which the fluid accumulates in the body cavity may help farmers to eliminate this disease.

In the great majority of cases fluid in the abdominal cavity means some derangement of the liver. In order to explain this it is necessary to give some slight account of the blood supply of that organ.

The blood which passes to the stomach and intestines through the arteries is distributed to these organs through the capillaries (small vessels). The nutriment which has been extracted from the food is here conveyed to the blood. But this is not carried direct to the heart.

Instead it is carried in the blood to the portal vein which enters the liver, and again splits up into capillaries which ramify through the substance of the liver. These eventually join up and form the hepatic veins which open into one large vein, and through this the blood flows back to the heart.

So it will be seen that in travelling from the heart to the stomach and intestines and back through the liver, the blood must pass through two sets of capillaries.

Now, if there is any derangement of the liver, opposition is offered to the flow of blood through the capillaries of that organ. This causes back pressure and leakage of fluid into the abdominal cavity. This fluid is usually colourless, because the colour of the blood is carried in the red corpuscles or blood cells, and these are retained in the vessels.

Liver derangement in sheep may generally be referred to three causes—

(1) Liver Fluke;
(2) Germs;
(3) Toxins or Poisons.

The first cause fortunately is not present in Western Australia, so need not be considered.

Germ-caused diseases represent too large a field to be dealt with here.

The third is probably the most important cause of liver trouble. Toxins or poisons may be of numerous kinds. It is impossible to attempt a complete classification here. But they comprise amongst others the following four classes:—

(1) What we will somewhat loosely term Chemical Poisons, *e.g.*, Arsenic, Strychnine, Prussic Acid, etc.;
(2) Plant Poisons, *e.g.*, York Road, Box, etc.;
(3) Food Poisons;
(4) Body Poisons.

The first two classes cause symptoms which may be more or less easily recognised, and are not likely to have caused the condition under discussion.

The fourth class is of some interest. All the organs of the body are continually undergoing wear. The process of this wear is thrown off in waste products which are often of toxic nature. These are eliminated by the bowels, kidneys, skin, and lungs. If, however, the process of elimination is interferred with, the toxins are absorbed into the blood and an autointoxication results. This result is most likely to happen in sheep when there is a lack of green feed and the kidneys and bowels, as a result, become sluggish.

Food poisons are not easily explained. When food causes injury to the digestive system, it may generally be referred to one or more causes—

(1) Spoiling of food by disease or fermentation, *e.g.*, Musty Chaff;
(2) Physical Characteristics;
(3) Badly Balanced Diet.

The first needs little or no comment.

The second is more important. The digestive organs of sheep are extremely efficient, but they are sometimes sorely taxed at the end of a long summer when sheep are turned on to harsh stubble or sand plain.

Badly Balanced Diet is, however, perhaps the worst offender. Bad balance may be brought about in two ways—

(1) Absence or lack of some ingredient;
(2) Excess of some ingredient.

(1) The ingredient which is generally lacking is green feed. I firmly believe that sheep graziers will need to counteract this either by growth of summer crops or by use of ensilage.

(2) The ingredient which I think is generally given in excess is protein. Asking a sheep to live on nothing but oats, bran, and linseed nuts is like putting a man on a diet of nothing but meat. This should be corrected by giving chaff, or better still, ensilage with the concentrates.

To sum up, Fluid in the body cavity is caused by liver trouble. Liver trouble is generally caused in this State by improper diet. The remedy is in the hands of the farmers.

CRINKLE OF ORANGES.

W. M. CARNE,

Economic Botanist and Plant Pathologist.

The term "Crinkle" is applied to the development of irregular depressions of the surface of oranges, particularly navels, running more or less at right angles to the length of the fruit (see illustration). Crinkled oranges have a puffy feeling when picked, quite distinct from the firm turgid feeling of normal oranges.

Crinkle develops while the fruit is on the trees. It is readily distinguished from the longitudinal corrugations frequently found on navel oranges of an inferior type. Such corrugations are characteristic of types of fruit, and the tendency to form them is transmitted through buds taken from trees with fruit of this type. Crinkle on the other hand is a disorganisation related to irregularity of water supplies duding the summer and autumn, and is common only in occasional years.

If orange trees make good growth during the first half of the summer and are then subjected to drought conditions, the fruit ceases to grow or grows very slowly. If the drought period has been sufficiently long and is followed by heavy rains or heavy irrigation the swelling of the juice cells in the quarters of the fruit may be so rapid that the rind and rag cannot expand fast enough. The consequence is that both tend to break, and split oranges result. Where, however, the drought period has not been so prolonged, or when light rains or light irrigations follow the drought, the strain resulting from the swelling cells of the quarters may be only enough to break the rag and not the rind. The rag then becomes more or less cracked, and with the growth of the rind the latter tends to collapse into the cracks, forming crinkles. Such conditions occurred this year. The dry period commencing in February was broken by the light rains of 7th and 9th May, before the heavy rains set in on 21st. The result was that while split fruit were not uncommon in orchards which had become very dry, crinkled navels were common where the soil had not become so dry.

Crinkled oranges are very liable to attack by blue and blue-green moulds. When subjected to pressure in picking, in packing, and in handling the packed cases, splits, usually minute, are very liable to develop in the crinkles.

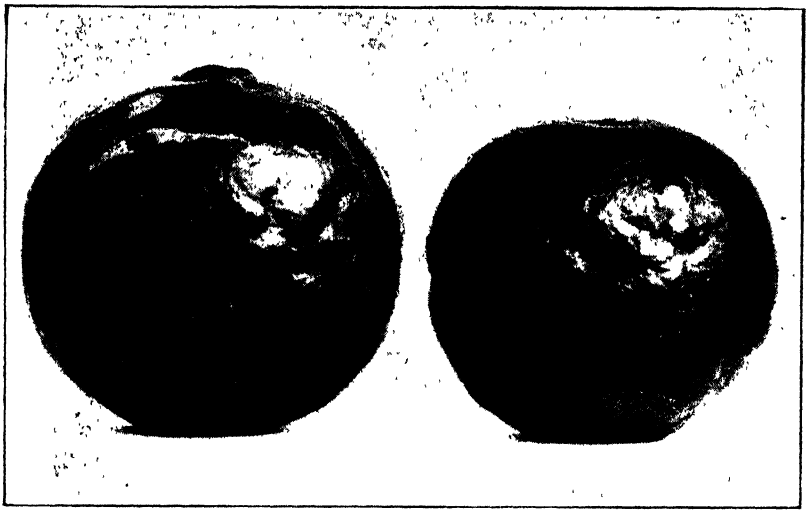
Once a crack has developed mould attack is almost certain, especially under our conditions owing to the high humidity normal during May to August (the picking season for navels), Crinkled navels picked during unusually dry periods in these months are less liable to mould than when the humidity is high.

During the present season upwards of 75 per cent. of the navel oranges in some orchards have been affected. Such oranges are dangerous to ship any great distance, especially overseas. However, they keep well enough to place on the Perth market if reasonable care is taken in handling. Except as regards their liability to mould, the quality of the fruit is not affected.

Prevention.—The method of preventing Crinkle is obvious, if not always possible of application. By proper cultivation and by judicious irrigation, when necessary, sufficient moisture should be kept in the soil to prevent the checking of the growth of the fruit. Heavy irrigation after the trees have definitely shown distress by wilting badly and dropping their leaves may induce rather than prevent the trouble. Moderate applications of water should be given whenever the trees, by the curling and wilting of the leaves, show that they are in need.

Where irrigation water is not available, little can be done except by early spring ploughing and attention to cultivation to conserve the soil moisture as much as possible.

Because of their earliness, navel oranges are particularly subject to Crinkle. Later varieties such as Valencias are rarely sufficiently advanced before the rains come to be affected.



Navel oranges showing crinkle.

Summary.—Splitting and Crinkle of early oranges, particularly navels, are consequences of a long dry period of insufficient moisture in the soil during the autumn and summer. Splitting results principally when a long period of soil dryness is followed by heavy rains. Crinkle is more common when light rains precede the heavy winter falls. Splitting and Crinkle are not frequent in well-cared for orchards in normal seasons.

Late varieties are much less liable to these troubles than early varieties.

Good cultivation to conserve soil moisture and the judicious use of irrigation during the hot dry months will prevent Splitting and Crinkle.

THE CUTTING OF POTATO SETS.

W. E. COLLINS,
Potato Inspector.

There are certainly occasions when the potato grower would be glad to cut his seed potatoes and plant the cut sets, but, in many potato-growing areas, cut sets are not planted because of the grower's experience that there is a great uncertainty as to the growth and healthy development of such.

It is to this problem that attention is directed here, and it can be shown that there is good ground to assume that, provided certain precautions are taken, the uncertainty as to the propagation of cut sets disappears.

In the spring crop, where the potatoes are usually planted in moist earth, the practice of cutting sets is followed regularly, and considerable confidence is felt in it. On the other hand in the summer crops, where the planting season frequently coincides with hot dry weather, the practice is regarded with distrust, and is but little adopted. In such seasons the grower has recollections of some years when carefully selected tubers, planted after cutting to make a limited supply go further, have rewarded his efforts by rows of "misses," so that a considerable portion of the ground has yielded no crop at all. Excessive rotting of cut sets is generally the consequence of high soil temperatures. What is absolutely essential to obtain successful crops is a cool planting, combined with a moderately cool season, whether cut sets or whole tubers are planted.

The optimum soil temperature for high yields is around 65 deg. F., any great increase above this tends to reduce crops.

In the light of the considerations advanced below, it would seem possible to follow the practice of cutting where other considerations seem to make it desirable, and at the same time almost completely protect oneself against the risk of such a failure on the part of the cut sets.

It is necessary now to consider the processes that occur at the cut surface of the tuber immediately after the cut is made; it will then be possible to show the experimental basis upon which the conclusion is reached that, if tubers are cut in a certain manner, they can be planted with as much confidence as whole tubers.

Like all other living plant tissues, a potato is a compact mass of tiny living cells, which are capable of displaying great activity under appropriate conditions. In the whole tubers these living cells are protected from outside influence by the corky skin consisting of many regular rows of flattened cells, which are deep and empty, but have their walls so impregnated with a fatty varnish-like substance that they keep soil water from percolating in amongst the living cells. This tough corky skin is also responsible for the fact that the numerous organisms in the soil, which thrive on dead organic matter, fail to thrive upon the rich organic store of the tissues within the tuber. If they were not protected by the corky skin, various moulds and bacteria of the soil would be able to grow upon and digest the walls of the living cells. These moulds and bacteria, however, are quite unable to attack the stores of plant food in the inner wall, because they can neither pierce the cells of the skin by force nor digest their way in, being unable to assimilate the fatty substance in the corky walls, which are akin in nature to the varnishes formed by drying oils such as linseed oil.

It is true that in the corky skin there are natural holes, places where gas exchange goes on between the air spaces inside the tuber and the soil—a necessary feature—because the living cells within the skins must breathe. The protection of these breathing pores against the entry of the various organisms of the soil is but little understood, and it is perhaps worth noting that the protection is by no means complete, and that the entry of various organisms which produce disease in living potatoes can be traced to penetration through their breathing pores.

If one's imagination will then picture the complexity of structure of a living tuber it will then be realised what the act of cutting across it with a knife may be. When the knife cleaves through the skin and shears through the living tissue, leaving a number of crushed and dying cells along the cut surface, the outside air obtains free entry to numbers of tiny corridors ramifying in all directions between the living cells, along which previously air movement had been but a slow gaseous diffusion.

Now when the outside air is thus brought in sudden direct contact with the living cells close to the cut surface, it will make a very great difference whether this air is dry or damp.

If the air be damp the living cells containing sugar and starch, from which more sugar is readily formed, will absorb water from the air, and as they become swollen, will let some of their sap ooze out into the walls. The sap thus diffusing over the cut surface, like a drop of liquid spreading in blotting paper, is not pure water, but a solution of various substances with drying qualities—known as a "suberin" deposit. As this deposit comes in contact with the outside air at the cut surface it tends to set to a varnish, similar in nature to that present in the cork walls of the normal skin.

The potato cut in moist air tends to form a continuous layer of this varnish-like substance below the dead cells, cutting off completely the living tissue within from the organisms in the soil capable of living upon their walls.

On the other hand if the potato be cut in dry air and left in dry air, less water is absorbed by the living cells than sap released into the walls, the deposit of suberin then becomes patchy and not continuous, and when the cut set is planted it seems to remain patchy for a long time, and between the patches the soil organisms penetrate. If the potato be cut and exposed not merely in the dry air, but in sunlight, this patchy production of suberin is much more marked, and the potato remains far more open to the entry of these organisms subsequently.

These organisms may cause the tuber to "miss" or may so reduce the food available for the growing plant that weak development may result.

The methods adopted by the Potato Branch to obtain this callousing or covering of suberin deposit, termed the "wet bag treatment" is to cut the sets into well-wetted bags, and leaving same for a period of 24 to 48 hours prior to planting.

During the experiments carried out at Burekup, July, 1927, six plots were planted with treated sets, as against six plots untreated, *i.e.*, planted immediately after cutting, the result being two tons per acre more in favour of those treated. The seed was equal, and on checking the germination was about the same, but it was noted that the treated sets "got away" first, and showed a more vigorous growth throughout.

Oher enthusiasts: Mr. J. Brighton, Elleker, and Mr. A. H. Clarke, Roelands, have had equally gratifying results, and it is hoped that further experiments will be tried by other growers along the lines suggested.

FIG WASP

(*Blastophaga grossorum*).

An interesting and successful experiment has been made by Mr. C. Sporn, of Coolup, in the production of out-of-season Capri fruits for the propagation of fig wasps. His method is as follows:—

"Capri No. 3 trees are given a dressing of sulphate of ammonia about the 7th October. This produces a strong growth of laterals. On or about the 1st of November these laterals are pinched back to about three buds. This has the effect of producing at once a supplementary crop of Capri fruits. These fruits are sufficiently advanced by mid-December to receive the issue of fig wasps, which emerge from the normal spring crop of Capri fruits on the same trees, on or about the 16th of December.

"These supplementary Capri fruits again issue wasps about the 1st February in time to caprify the fruits of Capri No. 1.

"By the production of this extra crop of figs on the same tree the difficulty of carrying the wasp over from crop to crop has been greatly reduced."

To be successful the above-mentioned conditions must be followed. If left too late, the supplementary crop will not be sufficiently advanced when the December issue of wasps takes place.

The leaders of the trees must not be interfered with, only the vigorous laterals being stopped.

FRUIT EXPORT.

(Season, 1927-28.)

GEO. W. WICKENS,
Superintendent of Horticulture.

"Fortune is a fickle jade," and mixes her smiles and frowns in a manner which is at times very disconcerting to the recipients.

Last year Western Australian apple growers received the most indulgent smiles and gladdest of extended hands, while their brother growers in the Eastern States barely obtained a nod of recognition.

This year the position was reversed; they were favoured with an abundant, even a record crop, and we had insufficient to meet our overseas commitments. Production figures are not yet available, but I estimated in December that it would be in the vicinity of one-third of the previous season's crop which amounted to 901,464 bushels, and when details come to hand I do not think the estimate then made will be much astray. Particulars of quantities exported are a fairly reliable guide to the quantity produced, and these show that for the year ending 30th June, 1927, 494,641 cases were shipped to overseas markets, while for the year ending 30th June, 1928, only 169,273 cases were sent away, or very little more than one-third of the previous season's total. Exports of fruit other than apples were nearly the same in both years, amounting to 69,771 cases in 1926-27 and 66,225 cases in 1927-28.

Though the quantity exported this year was comparatively small, it is interesting to note that many markets received Western Australian fruit. Full details are as follow:—

EXPORT OF FRESH FRUIT FROM WESTERN AUSTRALIA FOR YEAR ENDING 30TH JUNE, 1928.

Destination.	Apples.	Grapes.	Pears.	Oranges	Peaches	Nectarines.	Plums.	Lemons.	Passion Fruit.	Quinces.	Tomatoes.	Cherries.	Grape Fruit.	Total.
	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.	cases.
London	12,785½	6,992	5,505½	2,406	..	...		.	..	...	...	...	¾	27,689¾
Hull	413	351	1,736	.				.	.	..	...	..	...	2,500
New Zealand ...	...	583		459	.			30		...		...	...	1,072
Bombay	131	688	..							..	. .	...	...	819
Calcutta	27	589	...	40	...	.		.	. .	.	...	...	.	656
Durban	950	...	...	..	.	.	...		.	..	...	...	...	950
Colombo	1,868	12,569	89½	258	.		42	2	.	..	...	..	..	14,828½
Port Said ...	547	1,286	129	20	9		4	.	.	...	...	...	...	1,995
Hamburg	84,586	542	8,323¼	..	.	. .	.	.	..	8	...	...	...	93,459¼
Stockholm ...	42,678	. .	...	.		..	.		. .	.	...	...	...	42,678
Marseilles	12	...	...	..	.				..	.	...		...	12
Dunkirk	50	...	...	.	...		.		.	.	...		...	50
Sourabaya ...	5,123	2,390	358½	306	35	16	37	.	.	5	1	...	...	8,271½
Batavia	2,997	2,014	298½	810½	14	9	60	80	...		1	..	...	6,284
Singapore ...	16,819	13,049	309½	3,004	97	34	59	370	1	.	10	7	..	33,759½
Samarang ...	287	89	10½	63	...	. .	9	8	.	1	...	..	...	467½
Koepang	...	.	...	.	.	. .	6	.	.	.	...	...	...	6
Totals ...	169,273½	41,142	16,760¼	7,366½	155	59	217	490	1	14	12	7	¾	235,498

ROYAL AGRICULTURAL SOCIETY'S SHOW, 1928.

New Educational Sheep Classes.—As a result of suggestions made by Mr. A. J. McDonald, the well known stud merino sheep expert, the Royal Agricultural Society has decided to offer three special prizes in the open class for sheep. The first of these will be for a pen of 5 merino rams, over 1½ and under 2½ years old, bred by the exhibitor. They are to be entered for absolute sale at a rate of 20 guineas per head minimum, to be judged on commercial lines as most suitable for producing flock rams for Western Australian pastoral conditions, and to be sold by auction at the annual Sheep Show or Stud Sheep Sale. If the upset price of 20 guineas per head is not individually obtained the exhibitor will forfeit his claim to monetary award, and the prize money will revert to the Society and be available for future competitions in this class. There are two prizes in the first class, the first prize being 10 guineas and the second prize 5 guineas, and there must be three entries or no award.

The number two Special Prize open class is for a pen of 10 merino ewes under 2 years bred by the exhibitor, to have been shorn as lambs. First, second and third prizes in this award are 20, 10 and 5 guineas respectively. In the Eastern States this is a much coveted class and attracts keen interest.

The number three Special Prize open class is for the best exhibit of 5 sheep, bred by one owner, to be selected from the exhibits in the general class, only one animal to be drawn from any one class. Owners are to notify the Chief Steward not later than 9.30 a.m. on the morning of judging, which sheep they intend to compete in this class. There will be no stipulation as to the date of shearing but a certificate stating the number of days growth of wool up to the day of judging must be made with each entry and a declaration as to age may be required.

From an educational point of view the introduction of these three new classes should be of the highest value, and may afford excellent opportunities of comparison between local breeders' studs and those of the Eastern States.

Awards Nos. 1 and 2 will be separate entries, and none of the sheep competing in these is eligible for competition in any other class, and for exhibition purposes will require to remain penned intact throughout the show. The entry for No. 3 Award will require to be drawn from all classes exhibited by any one breeder, and the sheep after being judged will be dispersed to their individual pens.

As the rams in No. 1 are to be sold at public auction at prices not below 20 guineas per head an opportunity is thus afforded local stud masters and others interested in the industry to secure rams of outstanding merit for raising the standard of the average flocks of merino sheep in this State, for it will be observed that the rams are to be judged on commercial lines as being most suitable for *producing* flock rams for W.A. requirements. With regard to No. 2, should there be Eastern States competitors it is quite probable that some of these will prefer to sell their exhibits rather than return them to their parent flock, and here again will be an opportunity for extending and improving the standard of our local merino studs.

For further information on these Classes inquiries should be addressed to the Secretary of the Royal Agricultural Society, whose address is 283 Murray street, Perth.

POTATO CHIPS.

G. N. LOWE,
Senior Potato Inspector.

LOSS OCCASIONED BY LACK OF STORAGE FACILITIES.

Potato growers, more particularly in the Great Southern areas, are apparently not alive to the economic loss brought about by their not providing ample shed accommodation for their crops.

Whilst it is of no great moment where seed is concerned to allow it to stand for a time in the paddock after bagging, provided the sun is not too fierce, in the case of marketables, three or four days in strong light brings about "greening," even through the bag itself, to an extent which is surprising.

"Greened" potatoes for table purposes are not only unpalatable, but when this condition is accentuated can actually become unwholesome.

The action of light induces the formation of an alkaloid called solanine which in quantity in poisonous.

Buyers are well aware of the unpalatability of "greened" tubers, and accordingly discount their offers for such produce, often to the extent of £2 and £3 per ton.

Where a quantity of potatoes are grown the loss occurring annually to such a grower represents very often the cost of the material sufficient to build a moderate sized shed, and it is extremely poor business to allow this to recur.

It is no uncommon sight in one district which the writer has in mind, for the sewn bags to be allowed to stand on end in moist soil until it is necessary to lay them down to avoid the bottom rotting out.

A far sounder and much more economical practice is to provide shed room sufficiently closed in to prevent strong light entering and causing loss and at the same time allowing the necessary ventilation.

A little method will enable the grower then to cart in each day's digging, more particularly, of course, where no immediate orders are forthcoming.

It may be impressive and a cause for satisfaction to the owner of the crop to see some hundreds of bags of tubers standing in massed formation in the paddock, but his banker would doubtless lose less sleep if he knew the crop was safely transferred to cover promptly, away from the risk of flood and deterioration.

A DOUBLE PURPOSE WIND-BREAK SYSTEM.

Messrs. Blake Bros., of Young's Siding, adopt the planting of maize as a most effective form of wind-break on their peat swamp land cropped during the summer.

Heavy winds, particularly from the eastward, are the source of considerable damage to potato crops in their locality, and portion of Messrs. Blake Bros.' land is on the shores of the "P.U." Lake and considerably exposed.

Wind-breaks of maize on Blake Bros.' swamp, Young's Siding—12 rows of potatoes and 1 row of maize alternating.

Specimen of Delaware grown by Blake Bros.

The planting is divided into narrow "lands" by means of one row of maize during that operation, and the accompanying illustration gives an excellent idea of the protective growth afforded.

The space so lost is very little and the protection so provided more than compensates, as without it the production of heavy crops such as these growers are in the habit of obtaining, would be impossible.

This type of wind-break has, of course, another and very important utility in the provision of green stuff for stock feed during the summer, when the need of such is most acute.

These growers believe in thoroughness in all their farming operations and are accordingly successful.

Incidentally they provided the greatest number of bags finally passed under the Certified Seed Scheme this season, and illustrations indicate the class of seed grown by them.

Portion of Blake Bros.' crop in the course of digging.

THE INTERCHANGE OF CERTIFIED SEED BETWEEN GROWERS IN SOUTH-WEST AND GREAT SOUTHERN DISTRICTS.

Inquiries in this direction are frequently made as to the possibility of a direct interchange of Certified Seed from the growers of such in, say, the Young's Siding area, who have supplied growers in the South-Western area with their particular strain under the certificate.

Naturally enough, growers who have had good results over a period of years have great faith in their own strain of seed and are anxious to retain it.

A difficulty, however, often arises in the proper keeping of the "Delaware" on the racks for so long a period due to its earliness and consequent quick sprouting, and it is here where November dug seed from the South-

West for January and February planting in the Great Southern areas nicely "fills the bill." The same applies also in the crop dug in May in the South-West for the provision of seed in the October and November planting in the Albany district.

The demand is, however, only for Certified Seed, and growers in both districts by arrangement can have their crops inspected under the Scheme with this end in view.

The Potato Branch is anxious to foster this trade between growers in various districts and welcomes inquiries of this description.

Such an interchange from the standpoint of expense really only resolves itself into the cost of certification plus railage between growers and is distinctly preferable, of course, to buying possibly through merchants, who naturally must have their profit over buying price and railage charges.

Two tubers equal one fork-full in Messrs. Blake Bros.' crop.

Numerous instances have occurred this season where consignments have been brought from the Albany district to Perth, only to be reconsigned to the South-West almost at once.

The added railage alone in these instances amounted to about £2 per ton, which the grower-buyer had to pay.

RED-LEGGED EARTH MITE IN THE SOUTH-WEST.

At the time of writing, potato crops which are showing above ground are suffering badly from invasion by this pest.

Generally this active and destructive little insect is known as the "Red Spider" from its spider-like appearance, but the real "Red Spider" is distinct and is found in the autumn on the underside of apple, violet and convolvulus leaves for instance.

An excellent repellant against the Earth Mite is flake Napthalene broadcasted at the rate of about 1 cwt. per acre over the crop.

For ease and uniformity of sowing, dry sand to double the bulk of the chemical will greatly facilitate matters.

The application should be made just after a cultivation, the object being to allow it to remain on the surface where the higher temperature brings about the evolving of fumes which are so distasteful to the insect.

When a quick death dealing agent becomes necessary, nothing better has yet been discovered than sprays composed of water and carbolic liquids, commonly used as disinfectants.

Particulars of the disinfectants will be furnished upon inquiry.

APPLICATIONS UNDER THE CERTIFIED SEED SCHEME.

The attention of prospective applicants under the Certified Seed Scheme is directed to the following conditions which will operate in the coming season—

1. Their applications must be lodged with the Potato Branch early enough in the growing period to allow of at least two inspections prior to digging.

2. Notice of the intention to commence digging must be given to the Potato Inspection Branch 14 clear days beforehand.

3. The "strain" of the seed used in the area declared must be given where possible and from whence it originated.

4. The elimination of all plants of other than the specified variety must be attended to as soon as detectable.

5. The removal of all plants showing "Mosiac" (Crinkly leaf), Leaf Roll or other trouble, to be attended to as soon as noticed.

6. Tubers of 6 ozs. and over, only, are to be placed in the bags for final inspection, except in the case of March-July crops when 4ozs. shall be the minimum weight.

7. No seed is certified to until the Certificate is finally sealed on each bag.

8. Bags must be new, and be stencilled with the name and address of the grower in 2½in. letters.

9. Bags must be tightly double sewn, with the ends of the twine finishing in the centre of mouth of bag, and "Russian Hemp" twine is necessary in order to pass easily through the leaden seales.

10. No Certificate will be furnished unless the crop, considering the season, yield well.

11. A charge of 6d. per bag is made only for each bag actually passed.

12. To minimise "Storage trouble" forked and damaged tubers must not be placed in the bags.

13. Bags must be removed from the paddock and placed under cover as soon as is possible to avoid exposure troubles.

14. Briefly stated, the applicant must only place in his bags tubers for which he would willingly pay enchanced prices for seed purposes.

Growers will realise that for the sake of their own good name and future business that they must be absolutely careful as to what is placed in bags bearing their name and address.

Buyers have a right to expect the highest class seed that it is possible to buy when the certificate is attached to the bag and this Branch welcomes reports from buyers when they consider they have any cause for complaint.

Obviously, it is a physical impossibility for inspectors to examine every bag of seed and they have to rely largely on the grower to "play the game."

Should any complaint, upon investigation by officers of the Branch, prove well founded, the grower of the seed will confer a benefit after advice of such, by not forwarding an application in future seasons, as it will be politely but definitely rejected.

HERD PRODUCTION RECORDING.

Pure Bred Cows—Yields and Cost of Feeding.

P. G. HAMPSHIRE, Superintendent of Dairying.

P. C. COUSINS, Senior Herd Recorder.

Following the practice initiated five years ago in connection with herd production recording of pure bred cows, the fullest information is supplied showing details regarding the yields of herds of cows in Western Australia under the Australian Official Milk and Butter Production Recording Scheme. The data supplied includes details of the herds for the year 1927-28, together with the averages of former years.

In compiling the data the closest scrutiny is observed by official recorders of the foodstuffs consumed by the cows in each herd. The costs of the various foods debited are shown, certain of which are grown on the farms and are assessed at farm values, whereas concentrates are debited at average yearly market rates.

The information obtained may be viewed from many angles: herd average yields as milk and fat producers; herds expensively fed and herds economically fed; herds overfed and herds underfed. Profits over cost of feeding vary from £2 0s. 7d. to £17 18s. 3d. per cow, and in one instance a loss of

£4 19s. 2d. per cow. Profits of herds as milk producers vary from £4 6s. 9d. to £33 1s. 4d. per cow, and in one instance a loss of £5 4s. 7d. per cow is shown. One breeder is able to produce butter fat at a cost for feed of only £2 9s. 5d. per 100 lbs. fat yielded, whereas another finds it costs £8 14s. per 100 lbs. fat—this apart from the losing herd. Variations in the cost to produce one gallon of milk are from 3d. to 10½d. per gallon. The losing owner's herd cost 1s. 3d. per gallon produced to feed.

Herds, as profitable producers of milk or fat, vary considerably, and this generally follows according to the breed. One milking Shorthorn herd only shows a profit of £2 0s. 7d. per cow as fat producers, whereas as milk producers the profit is £12 3s. 10d. per cow. Another milking Shorthorn herd shows an increase from £17 12s. 5d. for fat to £33 1s. 4d. per cow for the sale of milk over the cost of feeding. Jersey and Guernsey herds, as a rule, do not show material difference as profit makers whether their produce is marketed as fat or milk, but in previous years we have many instances where these breeds show a greater profit as fat producers than milk producers. It should be considerable satisfaction to owners of good quality Jersey or Guernsey cattle to know that they can show as good a return from their cows by the sale of fat to a butter factory (even though they may be situated, say, 400 miles from the metropolis) as owners selling the'r produce as fresh milk and situated within range of the fresh milk requirements of the city.

The cost of feeding varies considerably, and in some instances this is principally due to the situation of the farm and the lack of farm-grown feed One owner with Herd "E" shows remarkably economical feed costs per herd as the result of the utilisation of rich pastures. In this instance the owner has a large area of mixed pasture which has been well looked after and topdressed annually. Silage feeders show economical feeding, especially is this so in districts where the lack of green feed is paramount in the summer.

In assessing the average returns, readers are advised that approximately half the cows in the herds under observance are heifers under three years. Taking this into considerat'on, the average return of all cows, viz., 281 lbs. butter fat in 273 days, may be cons'dered very satisfactory, as the data is derived from all cows under test whether or not they are above-standard producers.

That all pure bred dairy cows are not economical producers is clearly shown on perusing the details of the herds. The official recording of pure bred cows' milk yields is a basic principle of herd improvement in the utilisation of dairy sires for "grading up," and the accurate recording of the cost of feeding cows under test is a function corollary to testing. The aim of the Dairy Branch, in the first place, of supplying details of cost of feeding pure bred cows under official test was to disabuse the impression in some farmers' minds that pure bred cows' records were not economically obtained. The information secured in Western Australia during the last five years on the averages obtained may fairly be said to have achieved the purpose and definitely shows to the doubting "grade" herd owner the value of and where to obtain pure "production bred" dairy sires to proceed with a definite and reasonably reliable herd improvement policy.

Western Australia's First 1,000lb. Butter Cow.

"Pictoni Trequean Flirt."

Mr. A. W. Padbury's Guernsey Cow, which yielded under official test in 365 days 16,675 lbs. milk; average test 5.22 per cent.; 870.06 lbs. butter fat; 1,048 lbs. butter.

TABLE 1.—HERDS, IN ORDER OF MERIT, AS PRODUCERS OF BUTTER FAT—YEAR ENDED 30th JUNE, 1928.

Column.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
Herd.	Average Fat per Cow for period of 9 months.	Average Skim Milk per Cow for Period.	Value of Fat for Period at 1/7½ per lb.	Value of Skim Milk for Period at 2d. per gal.	Average Value of Fat and Skim Milk per Cow for Period.	Cost of Feed per Cow for Period.	Net Profits per Cow for Period through sale of fat.	Value of Whole Milk at 1/3 per gallon, allowing for rearing calf.	Net Profit per Cow by sale fresh Milk at 1/3 per gallon.	Cost of Feed per 100 lbs. of fat.	Cost of Feed per gallon of Milk.
	lbs.	gals.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	d.
A ...	349·62	351	28 8 0	2 18 6	31 6 6	13 8 3	17 18 3	32 2 6	18 14 3	3 16 8	5·46
B ...	370·00	653	30 1 3	5 8 10	35 10 1	17 17 8	17 12 5	50 19 10	33 1 ·4	4 16 8	4·65
C ...	384·46	446	31 4 9	3 14 4	34 19 1	17 13 2	17 5 11	38 6 1	20 10 11	4 11 1	6·09
D ...	396·26	499	32 3 11	4 3 2	36 7 1	19 6 10	17 0 3	41 13 9	22 6 11	4 17 8	6·15
E ...	255·66	285	20 15 5	2 7 6	23 2 11	6 4 6	16 18 5	26 8 7	20 4 1	2 9 5	3·0
F ...	289·36	341	23 10 2	2 16 10	26 7 0	12 13 0	13 14 0	30 4 4	17 11 4	4 7 6	5·25
G ...	325·56	367	26 8 10	3 1 2	29 10 0	19 10 8	9 19 4	32 11 7	13 0 11	5 19 10	7·71
H ...	188·29	244	15 6 0	2 0 8	17 6 8	8 5 3	9 1 5	22 11 6	14 6 3	4 7 11	4·21
I ...	304·29	451	24 14 6	3 15 2	28 9 8	20 15 4	7 14 7	37 5 6	16 10 2	6 16 7	7·12
J ...	255·94	418	20 15 11	3 9 8	24 5 7	16 15 5	7 10 2	34 10 9	17 15 4	6 10 11	6·05
K ..	225·76	196	18 6 10	1 12 8	19 19 6	13 4 4	6 15 2	20 16 0	7 11 8	5 17 0	7·58
L ..	266·77	336	21 13 6	2 16 0	24 9 6	18 0 0	6 9 6	29 14 2	11 14 2	6 14 10	7·52
M ...	245·04	212	19 18 2	1 15 4	21 13 6	15 5 5	5 18 1	22 1 9	6 16 4	6 8 9	8·68
N ...	276·07	284	22 8 7	2 7 4	24 15 11	22 10 0	2 5 11	26 16 9	4 6 9	8 3 0	10·48
O ...	263·89	427	21 8 10	3 11 2	25 0 0	22 19 5	2 0 7	35 3 3	12 3 10	8 14 0	8·18
P ...	214·52	157	17 8 6	1 6 2	18 14 8	23 13 10	Loss4 19 2	18 9 3	Loss5 4 7	11 1 4	15·16
Averages	280·56	353	22 15 9	2 18 10	25 14 7	15 11 4	10 3 3	30 19 0	15 7 8	5 11 2	6·31

Chaff. £5 per ton; Bran, £8 5s. per ton: Pollard, £9 5s. per ton; Crushed Oats, 3s. per bushel; Linseed Meal, £13 10s. per ton: Lucerne Pasture, 3s. per week; Lucerne Hay, £7 per ton; Green Maize, 7s. per ton; Silage, 10s. per ton; Brewers' Grains, 6d. per bushel; Pasture, 1s. 6d. per week; Sudan Grass Pasture, 3s. per week or 7s. per ton; Sub. Clover pasture, 3s. per week; Green Lucerne, £2 per ton; Barley Pasture, 3s. per week.

AVERAGES OF ALL COWS RECORDED

TABLE II.

1.—592 gallons Milk and 280·56 lbs. Butter Fat.
2.—353 gallons Skim Milk per cow.

	£	s.	d.
3.—Value of Butter Fat at 1/7½ per lb.	22	15	9
4.—Value of Skim Milk available for pig feeding	2	18	10
5.—Total credits to cow by sale of Butter Fat and Skim Milk	25	14	7
6.—Cost of feed for Period	15	11	4
7.—Profit by sale of Butter Fat after deducting feed costs...	10	3	3
8.—Value of Whole Milk if sold at 1/3 per gallon	30	19	0
9.—Profit by sale of Fresh Milk at 1/3 per gallon after deducting cost of feed	15	7	8
10.—Cost of feed per 100 lbs. Butter Fat produced .	5	11	2
11.—Cost of feed per gallon of Milk produced	0	0	6·31

HERDS IN ORDER OF MERIT AS PRODUCERS OF MILK

TABLE III.

Herd.	Milk. Average Gals.	Fat Average lbs.	Cost of Feed per Cow.	Profit as Milk.	Profit as Fat.	Cost to Produce 100 lbs. Fat	Cost to produce 1 Gallon Milk
			£ s d	£ s d	£ s d	£ s. d.	d.
B ...	925	370 00	17 17 8	33 1 4	17 12 5	4 16 8	4·65
D ...	755	396·26	19 6 10	22 6 11	17 0 3	4 17 8	6·15
C ..	698	384·46	17 13 2	20 10 11	17 5 11	4 11 1	6·09
E	516	255·66	6 4 6	20 4 1	16 18 5	2 9 5	3·0
A .	590	349·62	13 18 3	18 14 3	17 18 3	3 16 8	5 46
J	665	255·94	16 15 5	17 15 4	7 10 2	6 10 11	6 05
F ...	578	289 36	12 13 0	17 11 4	18 14 0	4 7 6	5·25
I ...	701	304 29	20 15 4	16 10 2	7 14 7	6 16 7	7·12
H ..	471	188 29	8 5 3	14 6 3	9 1 5	4 7 11	4·21
G ...	607	325 56	19 10 8	13 0 11	9 19 4	5 19 10	7·71
O .	674	263 89	22 19 5	12 3 10	2 0 7	8 14 0	8·18
L ...	515	266 77	18 0 0	11 14 2	6 9 6	6 14 10	7·52
K ...	418	225·76	13 4 4	7 11 8	6 15 2	5 17 0	7·58
M ...	436	245·04	15 5 5	6 16 4	5 18 1	6 8 9	8·68
N ..	515	276 07	22 10 0	4 6 9	2 5 11	8 8 0	10·48
P ...	375	214 52	23 13 10	Loss 5 4 7	4 19 2	11 1 4	15·16
	592	280 56	15 11 4	15 7 8	10 3 3	5 11 2	6·31

HERDS IN ORDER OF MERIT, SHOWING COST OF FEED PER 100 LBS. FAT.

TABLE IV.

Herd.	Cost of Feed per 100lbs. Fat.	Under Average.	Over Average.
	£ s. d.	£ s. d.	£ s. d.
E	2 9 5	3 1 9	...
A	3 16 8	1 14 6	...
F	4 7 6	1 3 8	..
H	4 7 11	1 3 3	..
C	4 11 1	1 0 1	..
B	4 16 8	0 14 6	..
D	4 17 8	0 13 6	...
K	5 17 0	..	0 5 10
G	5 19 10	..	0 8 8
M	6 8 9	..	0 17 7
J	6 10 11		0 19 9
L	6 14 10		1 3 8
I	6 16 7	..	1 5 5
N	8 3 0	...	2 11 10
O	8 14 0	...	3 2 10
P	11 1 4	...	5 10 2

Average of all Herds, £5 11s. 2d.

HERDS IN ORDER OF MERIT, SHOWING COST OF FEED PER GALLON OF MILK PRODUCED.

TABLE V.

Herd.	Cost of Feed per Gallon of Milk.	Under Average.	Over Average.
	pence.	pence.	pence.
E	3·0	3·31	...
H	4·21	2·10	...
B	4·65	1·66	...
F	5·25	1·06	...
A	5·46	·85	...
J	6·05	·26	...
C	6·09	·22	...
D	6·15	·16	...
I	7·12	...	·81
L	7·52	...	1·21
K	7·58	...	1·27
G	7·71	...	1·40
O	8·18	...	1·87
M	8·68	...	2·37
N	10·48	...	4·17
P	15·16	...	8·85

Average all Herds, £6·31d.

HERD AVERAGES FOR 5 YEARS, 1924–1928.

TABLE VI.

Year.	Milk.	Average Fat per cow for period of 9 months.	Average Skim Milk per cow for period.	Value of Fat for period	Value of Skim Milk for period at 2d. per gallon.	Average Value of Fat and Skim Milk per cow for period	Cost of Feed per cow for period.	Nett Profit per cow for period through sale of Fat.	Value of Whole Milk at 1/3 per gallon, allowing for rearing calf.	Nett Profit per cow by sale of Fresh Milk at 1/3 per gallon.	Average Cost to produce 1 lb. Fat.	Average Cost to produce 1 gallon Milk.
	galls	lbs.	galls.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	pence.	pence.
1928 .	592	280·56	353	22 15 9 (at 1/7¼ lb.)	2 18 10	25 14 7	15 11 4	10 3 3	30 19 0	15 7 8	13 34	6 31
1927 .	602	290 72	362	23 0 4 (at 1/7 lb.)	3 0 4	26 0 8	14 10 5	12 6 8	31 10 6	17 0 1	12·00	5·79
1926 . .	624	312·01	393	24 14 0 (at 1/7 lb)	3 5 6	27 19 6	14 14 7	13 4 11	32 5 5	17 10 10	11·15	5·66
1925	652	308·59	407	22 10 0 (at 1/5¼ lb)	3 7 10	25 17 10	14 13 2	11 4 8	30 10 5	15 9 5	10·77	6·15
1924	600	319·50	362	25 19 2 (at 1/7¼ lb.)	3 0 4	28 19 6	10 4 10	18 14 8	32 1 3	21 16 5	7·7	4·09
Average for 5 yrs.	614	302·29	373	23 18 6 (at 1/7 lb)	3 2 2	27 0 8	13 18 10	13 1 10	32 7 8	18 8 10	11·08	5·45

THE WYNDHAM MEAT WORKS.

By The Editor.

In June, 1915, Parliament passed a Bill for the establishment of Meat Freezing Works at Wyndham, actuated by a desire to supply meat for the allied troops, and at the same time assist in the development of those immense areas of pastoral country that form the Kimberley Division of this State. Synchronically at Port Darwin the erection of Meat Freezing Works for the well known firm of Vestey Bros. was in progress with a similar object and for the immediate advancement of the pastoral industry in the Northern Territory. Some feared that these two ventures taking place in what, for a country of such vast distances, might be termed close proximity, would militate one against the success of the other. There were differences of opinion upon the advisableness of the step taken by the State Government, but in the main it was agreed that the movement must help along the progress of North-Western Australia. Years have passed and, unfortunately, Vestey Bros.' Works, by far the larger of the two mentioned, has ceased operations, but the plant remains a monument to the enterprise of those who strove to meet the national need and carry on for a while a work of paramount importance. The Wyndham Meat Works, however, still continues to operate for the benefit of the State, and while unable to keep the wheels of industry revolving throughout the full year, owing to an insufficient supply of cattle, the work in season is a substantial contribution to the furtherance of the cattle-raising industry of the surrounding country for many miles.

Rake of Tallow (44 tons). Part of shipment for London.

A visit to the Wyndham Meat Works is included in the itinerary of a North-West run by our coastal steamers in the touring season. To those who have read the gruesome descriptions of freezing and canning works in some parts of the world, it is probable that this item in the tourist's programme will have little appeal. Nevertheless, it can be truthfully stated that, as carried out at the Wyndham Works there is a minimum of the sordid, and the expedition and efficiency of the plant and staff create an interest that neutralises the repulsion generally associated with the slaughtering of animals.

Cattle for the Wyndham Works are brought in from the surrounding country for hundreds of miles and pastured at Chimooli, eight miles from the township, and from thence drafted to the killing yards as required for each day's operations. The approach to the killing pen is by a long race terminating in the interior of the building. The pen is entered by a doorway, and the animals are not unduly excited as they come to a halt one at a time. On an elevated platform stands the knocker-down armed with a heavy sledge hammer, and this operator, like all others engaged at the works, is an expert at his calling, and works swiftly and accurately. During a two-hours' visit to the Works never once did the writer see an animal move voluntarily after the stroke of the hammer had been delivered. Coincidently with the fall of the beast the floor of the pen drops to one side and the carcase rolls or slides to the cement floor of the huge building. Here it is immediately seized by the chainer-up, who deftly encircles the hind legs, and it is at once hoisted up to steel rail travelling way, which runs round three sides of the interior, and is passed to the bleeder, thence to another operator who quickly removes the head, and then to the skinner who removes the hide. From the time when it dropped to the floor of the killing pen there has never been the slightest struggle or sign of returning consciousness, and nothing could be more humane than the conduct of these operations. The carcase is then opened and pushed along to the inspector for examination. Of these there are three, the chief or senior being a veterinary officer. Having been certified free from diseases the offal is removed and passed through

Rake of Dried Hides (120 tons). One shipment for West Australian Tanners.

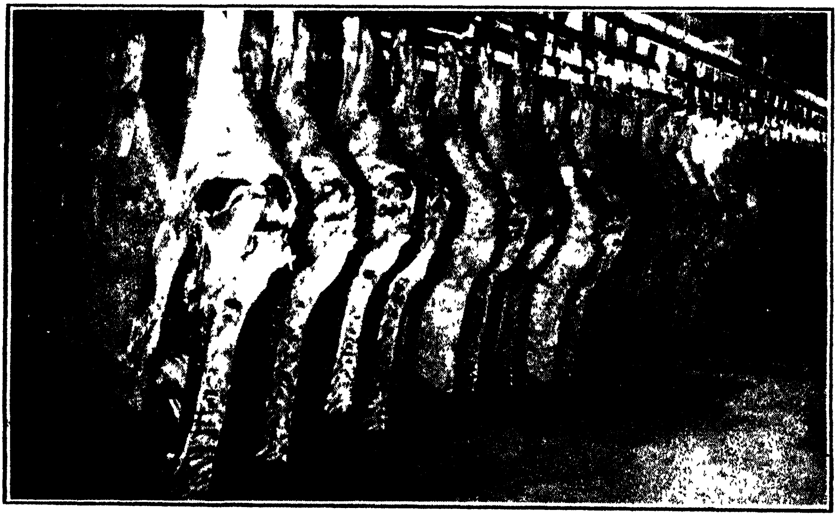
various chutes to the building below where a receptacle is waiting to receive whatever part of the entrails is to be treated. The carcase is then split down by a circular saw swinging from the girder and worked by electricity, This saw is guided by handles at each side of the axis around which the blade revolves and is so adjusted as to be lowered or elevated as the work requires. Having been thoroughly washed and cleaned the sides then disappear into the chillers. Subsequently these sides are graded and quartered and then passed through to the freezing chambers, where it is sewn up in hessian and remains there some five days until it is properly frozen and ready for shipment. In other freezing chambers are to be found a variety of parts such as tongues, tails, kidneys, hearts, livers, cheeks, tripes, shin beef, neck beef, clod beef, all frozen as hard as stone and stacked in orderly profusion. Most of these pieces are exported to England, although there are also orders for Fremantle.

Loading Tallow and Case Meats on to Meat Boat.

In the Canning and Extract Departments goods for export and local sales are prepared, and comprise a variety of dainties calculated to tempt the appetite. It is said that the manager of this sub-department excels in the preparation of these comestibles, and the demand for his productions, coupled with the recent contract obtained for the supply of the Commonwealth Naval Department's requirements, amply support the contention. Boiled and corned beef are mainly put up in 6lb. tins, while assorted meats are contained in 1lb. and 2lb. tins, and are principally for export or coastal trade supply. Other products are roast beef, sausages, ox tail, mince collops, luncheon beef, steak and kidney, cheek and beans, ox cheek, and haricot steak, whilst dripping is also put up at the Works and has a ready sale packed in 24lb. and 38lb. cans. The Wyndham extract of meat enjoys a wide reputation for excellence and strength. In the process of manufacture the meat is cooked in huge scalds and gradually reduced by steam to the right consistency, and when the moisture has been removed it is packed in 12oz. and 56lb. cans; the former for local trade and the latter for export. These smaller cans are air tight and so put up that they can be reclosed when portion of the contents have been removed, thus preserving the food in pure condition over a period.

It has been said that in some of the large canneries in Chicago nothing is wasted but the squeal. At Wyndham there is no squeal to waste, and consequently nothing is wasted. The offal of all kinds, after the tallow has been extracted, is reduced to fertiliser and poultry meal, and there is a far greater demand for these side lines than the Works are able to supply.

Where there is to be no waste it is essential that a huge undertaking of this nature must be practically self-contained, and this the Wyndham Meat Works claims to be. It administers numerous departments, among which are included a Cattle Purchasing and Receiving Department, involving even the inspection of cattle runs, and the advancement of loans to growers for the purpose of expenditure in the direction of increasing and improving the crop of cattle upon which the operations of the works depend. Such loans are used in the purchase of bulls, fencing of runs and providing water supplies for stock.



Beef in Freezing Chamber.

In addition to the Slaughtering and Freezing Departments there are others for the manufacture of accessories to the business. Thus there is a tinshop where tinplate is cut and fashioned into containers for the various products, a box-making factory with up-to-date machines turning out cases, in the making of which karri timber is chiefly used; a cooperage with cunning devices by which staves, tops and bottoms are cut from the seasoned material, shaped, bound and converted into sound barrels for the shipment of tallow, edible fats, oil, etc., etc. In another apartment employees are

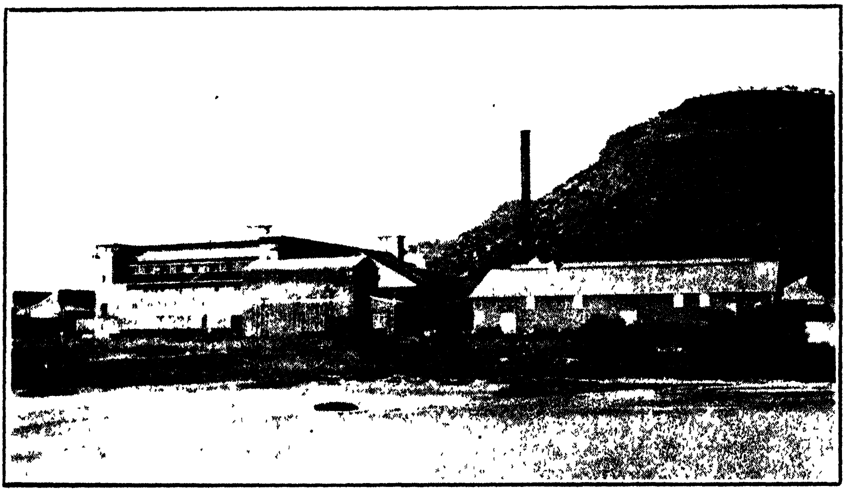
Yarding Cattle at Works.

View from top of Main Freezing Block.

busy cutting and sewing bolts of hessian, and transforming them into suitably shaped coverings for the quarters of beef and other commodities to be frozen. Then there is the Hide Department, where skins are salted and cured, ready for despatch to the tanneries; and in all departments labour-saving machines of modern type are in use and waste energy eliminated in every manufacture.

The motive power at the Works comprises four sets of Diessel engines and two water tube boilers, all using crude oil for fuel, of which there is a large reserve included in the outlay of the plant as well as refrigerating machines with power motors, generators and lighting installation.

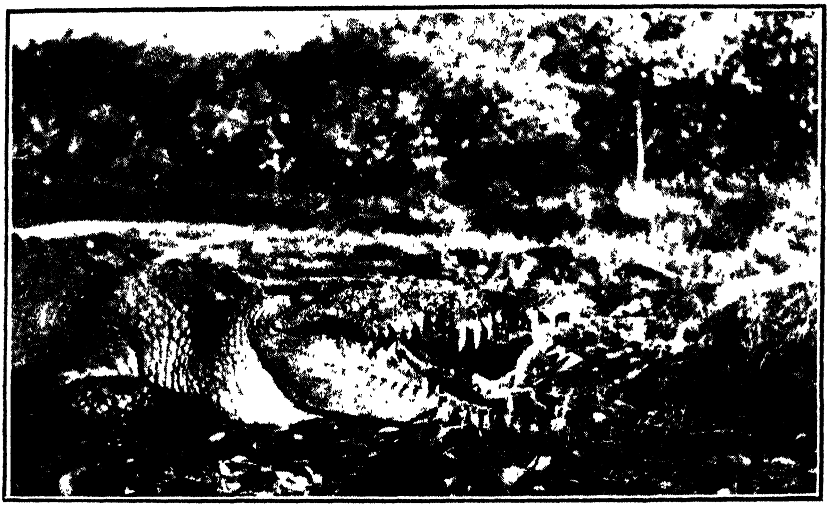
On the foreshore a jetty is provided having a berth accommodation of 30ft. of water at low tide, capable of receiving the large ocean-going steamers which load the frozen beef, tallow, and other products exported to Great Britain, the Continent and ports along the Suez route, the agency and stevedoring of these steamers being provided by the meatworks staff. The State motor vessels "Koolinda" and "Kangaroo" also berth here and inward and outward cargo for the works and the township are handled by staff and operatives, while a railway under the same management connects the jetty with Wyndham. At low tide along the foreshore, and especially where the effluent from the works discharges into the sea, huge crocodiles are to be seen on many occasions, some of these being 12 to 15 feet in length. Although not without some tragic happenings, it is fortunate that these amphibions do not wander far from the water's edge, and as the townspeople are wary few accidents have been recorded.



Front view of Freezing Block, Power House and Store. Mt. Bastion in background.

From the King River, 20 miles away, a fine water supply is obtained and conveyed by pipes to the 1,000,000 gallon concrete reservoir situated on the hill which overlooks the works, and from this the township and shipping, as well as the Meatworks, are supplied. The Works also maintains the launch "Kimberley," by which pilotage and other port services are rendered.

A notable feature of the undertaking is the co-operative spirit developed throughout the staff, for whom every comfort and convenience, consistent with a sub-tropical climate, have been provided. Before the season commences most of the employees are brought up from the metropolitan and coastal districts, and during the operating period they are housed in substantial buildings contiguous to the Works. A dining room and well equipped kitchen, with a capable staff, provide excellent meals, and for recreation there are out-door and in-door picture and dance halls. reserves for out-door sports, billiard room and a dry canteen. Both men and women appear to be well satisfied and, as a result, there is never a shortage of labour, but rather a rush to secure an engagement when the season is about to begin. As each employee becomes more or less a specialist in his work, and as each rarely fails to apply for re-engagement at the commencement of the season, there is very little change in the personnel of the staff from year to year.



Alligator enjoying early morning sun at back of Meat Works.

Apart from making a profit over working expenses, the Wyndham Meat Works serves many useful purposes from which the State receives indirect benefit. One of the principal handicaps is a lack of continuous supply of cattle to keep the Works operating. During the 1928 season 27,127 head of cattle were treated, but owing to the dry season experienced the beef was much lighter, although the quality was much better than had been anticipated.

Cattle are purchased from growers under a purchase contract and paid for by dressed weight, and all sellers, whether large or small sales are effected, are on an equal footing as regards prices, terms and conditions. The scale of prices is fixed for the season and the rates per 100 lbs., dressed weight, accord with the grades of beef, whether export or non-export qualities. Prices depend also upon the months in which the cattle are treated. It is necessary to spread deliveries of cattle over the operating season according to the capacity of the works for treatment. Suppliers who cannot be accommodated during the most favourable months for good yields of beef are paid higher rates to compensate, as shown in the following scale:—

4. Prices.—In respect of cattle delivered in accordance with this agreement, prices shall be computed upon the chilled dressed weight of the carcases over the scales at Wyndham Meatworks, at the following rates per 100lbs., namely:—

(a) For beef " Approved " and/or " Passed " for export, under " Commerce Act " Regulations, hereinafter referred to as export beef—

	Grades.	
	Approved.	Passed.
	£ s. d.	£ s. d.
From cattle slaughtered on or before 30th April	0 19 0	0 16 4
From cattle slaughtered on or after 1st August	0 19 0	0 16 4
From cattle slaughtered after 30th April but before 1st August	0 18 0	0 15 4

	Rejected.	Condemned.
	£ s. d.	£ s. d.
(b) For beef not accepted for export but passed for local consumption or for canning ...	0 6 6	...
(c) For beef condemned	...	0 5 0

Such prices cover purchase of the whole animal, including hide and all other products.

If the average realisation of the exported frozen beef exceeds the estimates upon which the scale of prices has been based, the excess is distributed to the suppliers pro rata on the exported weights of beefs from their respective cattle. The 1927 season's returns per head to suppliers ranged from £5 7s. downwards, the average of 26,374 head treated being £3 19s., although the figures may yet have to be adjusted by a few pence when complete returns have been received and accounted.

There can be little doubt that these works are playing an important part in the development of the far North of this State, and are destined to enlarge their sphere of usefulness in the supply of meat to our Metropolitan markets when the supply of cattle increases and means for transporting chilled instead of frozen carcases come within the scope of practical politics. Every credit is due to the Government and to the management and staff of operatives and officials for the practical aid they are rendering the squatter in the great North-West.

GUILDFORD GRASS.

(*Romulea rosea* (Linn.) Eckl.)

W. M. CARNE and C. A. GARDNER.

This common weed is more generally known in the Eastern States of Australia as "Onion Grass,'' Although residents of the South-West, and particularly the metropolitan area, are familiar with this gregarious plant, it has not been established here for as long a period as many of our common weeds. It was not known in this State in 1870, so that its spread is all the more remarkable. At least three species or well marked forms are now naturalised in Western Australia. One has yellow flowers, the others having pink or violet flowers. The genus is a large one, the species extending from Southern Europe to South Africa.

Th generic name, Romulea, is derived from Romulus, who with Remus was the founder of the city of Rome; several species grow in the Roman States. The specific name refers to the colour of the flowers.

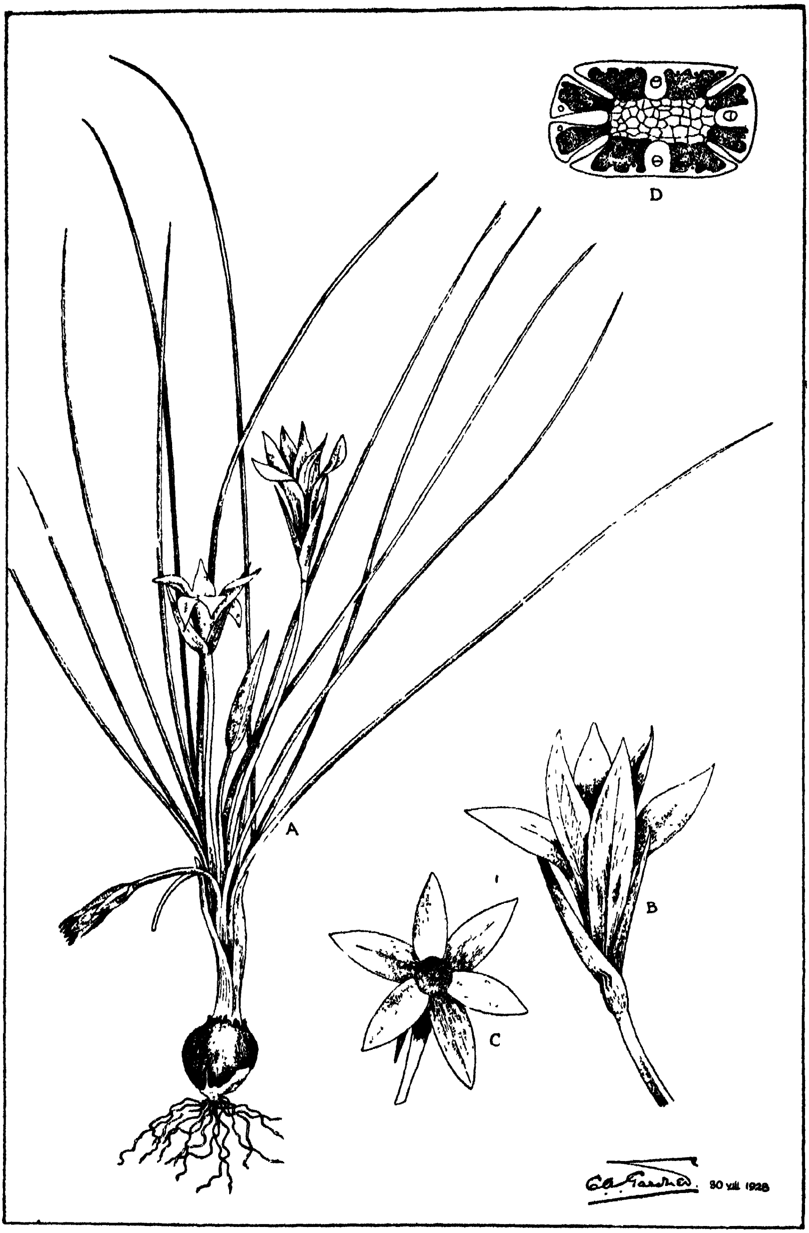
In Australia the distribution of Guildford Grass is mainly determined by the climate. It prefers a mild winter with a rainfall of 25 inches or more, and a relatively dry summer. Heavy or clay soils are preferred to sandy or light soils. It does not thrive in places which are dry in winter or in soils rich in humus.

The weed is distributed by small corms and by seeds. Stock and birds may help in the spread of the seeds. Both means of reproduction are very effective. In certain localities, such as the Helena Valley and the banks of the Swan River, the weed has become so gregarious in the bush that it has succeeded in replacing the shrubby vegetation. The corms (popularly known as bulbs) are rich in starch, containing nearly twice as much as potatoes. The fruits before ripening have a flavour which is not unpleasant, and are known to children as "puddings." Children sometimes eat the corms also. The leaves have a very low fodder value, and characterised by bands of strong fibres.

Economics.—Guildford Grass must be regarded as a serious weed in the coastal belt, especially on the heavy soils of Swan Valley. It occupies the ground to the exclusion of more useful plants and provides little feed for grazing stock, though eaten to a small extent when young. When the leaves are mature, the fibre renders them very indigestible. If eaten by horses, it may cause indigestion and colic and it is reputed to cause scouring in young cattle. Pigs on the other hand will root up and fatten on the corms.

There are possibilities of the plant proving useful as a source of fibre but this has yet to be commercially demonstrated.

On lawns and playing grounds the weed is decidely objectionable. Except when very short, it is difficult or impossible to cut with a mower. On playing grounds it makes running difficult and players are very liable to slip.



Guildford Grass.

(*Romulea rosea.*)

Control.—The most effective and economical method of controlling Guildford Grass in pastures is to sow clovers, particularly subterranean clover, and to top dress each autumn with superphosphate. A strong growth of clovers and grasses is followed by a weakening and disappearance of the weed. The weed is of little consequence on cultivated land. Where a pasture is badly affected it can be cleaned in a few seasons by ploughing in the autumn and sowing crops of oats with about 2 lbs. subterranean clover seed per acre. A top dressing with superphosphate should follow each autumn until the weed is well under control.

Lawns should be close cut and top dressed with well rotted stable manure. The manure should have been stacked long enough to ensure the death of the weed seeds it is certain to contain. If only patches of Guildford Grass are present, the turf should be taken up at a depth great enough to include the corms and replaced with clean turf. Playing grounds should be ploughed over when the plants are in flower and left in the rough until the return of the warm weather in late spring.

Description of Plant.—A perennial herb. Corms globular and covered with a shining brown tunic. Leaves 4-15 inches long, bright green, somewhat flaccid, deeply groved on each face, thick, resembling a Maltese Cross in section. Flowers solitary, 2-4 on each plant, on stalks much shorter than the leaves, the spathes with two valves. Flowers pink to pink-purple with a yellow throat, up to 1 inch in length, greenish outside. Segments of the flower 6, stamens 3 with hairy filaments; style slender with 3 bifid branches, shorter than the stamens. Fruit a 3 celled capsule oblong in outline; seeds numerous and brown in colour.

Another species with pale violet flowers (R. parviflora) has narrower leaves, usually shorter flower stalks and both the spathe valves brown-dotted, whereas in R. rosea only the upper valve is dotted.

R. rosea is native to South Africa, while R. parviflora comes from Western Europe. Both species flower between August and October.

These plants are not grasses, but belong to the Iris family.

RUTHERGLEN BUG.

(Nysius vinitor.)

Order: *Hemiptera.* Family: *Lygaeidae.*

L. J. NEWMAN,
Entomologist.

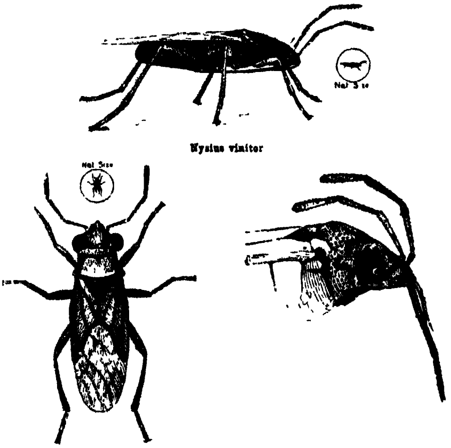
The Rutherglen Bug belongs to the Order *Hemiptera* and to the Family *Lygaeidae.*

The adult members have four wings, and are capable of considerable flight. It is what is termed an Haustellate or sap-sucking insect, in both the pre-winged and winged stage.

The adult is a small light brown fly-like insect, measuring about one-sixth of an inch in body length and slightly under one-quarter of an inch from wing tip to wing tip, when these organs are fully expanded.

The wings are silvery grey, semi-transparent, and traversed by a few dark lines, which form a somewhat undefined cross on the back when folded.

The elongate slightly curved white eggs are laid in clusters upon certain weeds or cultivated plants. They hatch in from six to 10 days into tiny nymphs. The nymphal stages, of which there are five, occupy about 24 days. The bugs are then full grown, making a maximum period of 34 days, from egg to adult.



N.S.W. "Journal of Agriculture."

The adult bug is incapable of depositing eggs until 10 days after the final moult. Eggs are then deposited over a period of three weeks. From three to 400 eggs may be laid by each female.

During the pre-winged stages the bugs are somewhat scattered, but when adult they are gregarious, moving about in vast armies. It is during the adult stage they usually fly or find their way into the cultivated crops of fruit or vegetables.

The food of this bug is obtained by the insertion of the rostrum or beak into the sap cells of the plant that serves for their nutrition.

It is their concentrated hordes that causes the very great damage to crops such as potatoes, tomatoes, Cape gooseberries, etc.

The weather by the time the adult bug stage is reached has become hot and dry. It is under these conditions that a sucking insect, such as the above, causes very serious damage. The crop is naturally finding the conditions somewhat dry, and consequently the supply of moisture to foliage has become reduced. Further, the loss of moisture by transpiration through the leaves, is very great. Plus this, by the attack of myriads of sucking bugs and the plants soon show signs of stress, resulting in shrivelled leaves and consequent reduction of crop.

During last October to December plagues of this bug were experienced in many parts of the South-West, potato crops in particular being seriously damaged.

Prevention.—First and foremost we must take preventive measures. Experience has taught us that it is very difficult to attack this pest when it gets into a crop without causing damage to the fruit or vegetables.

Complete farm or orchard sanitation must be practised, which means the keeping down of all weeds and rubbish, and the cultivation of the orchard or crop.

It is a common mistake with many growers to permit the headlands and fence alignments to become rubbish tips, and all sorts of weeds allowed to grow there. It is of little use spraying the crops, if alongside these conditions exist. The bugs will find shelter and breeding grounds therein, and will rapidly reinfest the previously treated crop. By clean farming methods many of the pests now injuring our crops can be suppressed.

As far as is possible land to be cropped should be kept under clean weed-free fallow several weeks before planting.

The absence of weeds or other rubbish will render the conditions unattractive, and hence the land will be clean when the crop is sown. If rank growths of weeds and rubbish are allowed to accumulate until just before the crop is to be planted and then turned in, insect troubles are sure to follow.

To fallow land is the greatest insurance against crop pests that we know of.

Treatment.—Keep a sharp look-out for the first signs of the pest, and take immediate action.

Occuring in colonies as they do, they can readily be destroyed with any approved sprays or dusts.

It must be distinctly understood that being a sucking insect, it is of no avail spraying in the ordinary way with arsenate of lead or Paris green, as these poisons so applied are only effective against mandibulate or chewing insects.

The effectiveness of contact sprays or dustings depends upon the thoroughness of application. The objective is to bring every bug into contact with the insecticide being applied. In other words, you only kill those you hit.

An effective proprietary spray is that sold under the name of Benzole emulsion. It should be used as directed on the containers: 1lb. to 5 gallons of water.

A home-made preparation which has given good results is made as follows:—Sunlight soap, 8 ounces; turpentine, 8 tablespoonsful; water, 4 gallons. Shred the soap and dissolve in 2 gallons of boiling water. Remove from fire and add the turps stirring well for 5 minutes. When this operation is completed, add the balance of 2 gallons of hot water. Apply hot.

For such crops as potatoes the following mixture is good:—1 quart of phenyle, 3 lbs. washing soda, 1 bar of yellow soap, 40 gallons of water. Shred the soap and dissolve in boiling water, to which the other ingredients are added, and make up to 40 gallons.

A sweetened poison bait, consisting of ¼ oz. arsenate of soda dissolved with 3 lbs. of molasses or treacle, and 1 gallon of water will act as a poison.

The bugs readily suck up the sweetened poisoned liquid, and are killed thereby.

Note.—This spray can only be applied to weeds, straw, or other material that may be spread about for the purpose. If applied to the crop foliage, it will have a burning effect.

Carbolic Lifebuoy soap, 1 cake to 1½ gallons of water, is effective. Black Leaf 40, 1 pint to 80 gallons of water, with 3 lbs. of soap. Shred the soap and dissolve by boiling, and add to the Black Leaf 40.

Cyanogas Dust A.—Experiments with this dust were made, and proved it to be the most effective of all specifics tried.

This is a prepared calcium cyanide, which is applied per medium of a dust gun.

The best results follow the application of this insecticide, if used during the heat of the day and when little or no wind is blowing.

In the trials made, the amount of dust used was 25 lbs. per acre. The effect was instantaneous, the bugs falling dead in masses.

Like all other insecticides, it must be thoroughly applied and sufficient used. In many instances failure to obtain satisfactory results is due to the skimping of the amount applied. This dust, together with full instructions how to use, is obtainable from city merchants.

Trapping method.—Make shelters, or congregating places for the bug, by piling heaps of rubbish here and there. The bugs will congregate under these heaps, and may be destroyed by spraying them with any contact wash or the application of boiling water. The bugs in these heaps must be dealt with before they become warmed up by the sun.

Another method of trapping.—Take a tarred sheet of canvas, and spread under the vines or trees affected. This should be done in the morning whilst the bugs are somewhat inactive.

Jar the trees or vines with a stout piece of wood, wrapped in bagging, so that the bark is not bruised. The jarring will cause the bugs to fall on to the tarred sheet, where they will be held captive.

If possible to fire an infested area, myriads of bugs can be destroyed.

It behoves all growers to be on the alert, and take action as soon as the pest makes its appearance.

Co-operative effort is needed so that all swarms may be attacked and destroyed.

WORMS AFFECTING SHEEP IN WESTERN AUSTRALIA.

H. W. BENNETTS, M.V.Sc.

Worms are one of the chief causes of sheep troubles in this State, and many sheep are lost annually from ravages of these parasites, particularly during the period from summer to early winter.

The most important worm economically is probably one species of stomach worm (*Haemonchus contortus*), though other species of stomach worms and lung worms are also responsible for loss.

Though sheep of all ages are liable to infestation with worms, young sheep are more prone than mature animals to display symptoms. Nevertheless, it must be remembered that the older sheep running in the same paddock will be carrying the parasites too, and increasing the infestation of pastures and young stock.

The majority of worms require for their development, outside the body, both moisture and warmth. For this reason wet and low-lying ill-drained land is liable to be heavily parasitised, and consequently dangerous to stock depastured on it. Over-stocking is one of the greatest factors in propagation of parasites.

1.—GENERAL CONTROL MEASURES.

Bearing the above facts in mind it will be seen that on properties where parasitic troubles are experienced, the following general measures should be adopted:—

(a) Treatment of sheep as indicated specifically later.

(b) Young sheep should be separated as early as possible from older sheep, and run on the highest and driest parts of the property.

(c) Sheep should, as far as possible, be watered from troughs. Soaks, drains, etc., provide ideal breeding grounds for parasites. Where worms are known to be a menace waterholes should be fenced off and mills, tanks, and troughs installed. Where possible low-lying pastures should be drained.

(d) Over-stocking should be avoided, and the general health of sheep built up with a generous supplementary diet such as oats and concentrates.

(e) Licks, such as the following, may also be of service: salt, 40 parts; bonemeal or superphosphate, 10 parts; iron sulphate, 4 parts.

2.—STOMACH WORMS.

The barber's pole worm (*Haemonchus contortus*) appears to do more damage to sheep in this State, than any other species.

It is about a quarter to half an inch long and very fine, and it is easily recognised because of the spiral red and white striations in the female, to which that parasite owes its common name. Its habitat is the fourth stomach, where it lies free or attached to the lining. There are also other smaller species of stomach worms—chiefly the *Ostertagia* species—which can just be seen with the naked eye. These species are not nearly so common as *Haemonchus contortus.* The symptoms produced are similar in each case and the treatment is the same, though not so effective for *Ostertagia.* If very numerous, stomach worms can easily be seen on account of their writhing movements in the contents of the stomach. If they are not sufficiently numerous to be detected in this way they may be found, if present, by diluting some of the contents of the stomach and scrapings of its lining with water, putting it into a shallow glass vessel, and swilling the mixture around over some dark surface. The whitish worms can then be seen against the dark background.

Symptoms.—Young sheep, especially weaners, are particularly liable to be infested. The symptoms of infestation are scouring and loss of condition, anaemia, and frequently "bottle jaw," with death from a week or two up to several months after the appearance of symptoms.

After death the carcase will be seen to be very emaciated, and the body cavity often contains a large amount of fluid. Bottle jaw is due to collection of fluid below skin. The blood is "watery." Mortality may be up to 100 per cent., and in spite of recovery untreated animals may remain carriers from two to four years.

In this State sheep usually show symptoms in the summer and onward into the early winter.

Life History.—The eggs of the worm are passed out in the dung, thus contaminating the pastures. They, however, require moisture and warmth for further development, and will not survive dry conditions for any length of time. Apparently, in this State, large numbers of eggs hatch out in the spring (warmth and moisture). Natural infestation results from the ingestion by the sheep of the "larvae" (young worms), which have reached the infective stage, either with feed or with drinking water. Infestation on pastures is favoured by the fact that larvae will follow moisture (dew and drops of water) that collect on the ends of blades of grass at night and on rainy days. The pastures become increasingly infected year after year by sick animals or even apparently healthy animals which are carrying the parasites and excreting enormous numbers of eggs.

The larvae are very tenacious of life, and are able to withstand very unfavourable conditions (such as dryness or the direct rays of the sun) for a very long time. In fact they may live on pasture even under adverse conditions for at least twelve months. For this reason a pasture cannot be considered free from infection for a year or more after the last affected sheep has left the property. *Haemonchus contortus* also affects cattle.

Treatment.—On properties where the stomach worm is known to cause losses, it is well not to wait for the symptoms to show themselves before commencing treatment. A start should be made about September or October when pasture infestation is becoming heavy, whether the sheep have begun to show signs or not.

The following drench is recommended:—Dissolve ¼ lb. of clear blue crystals of copper sulphate in a pint of boiling water. When making the solution use a porcelain or enamelware dish, as bluestone will corrode most metals, and leads to a chemical change in the solution. Add to this enough cold water to make it up to three gallons, using non-metallic receptacles. The sheep should be starved at least overnight and up to 24 hours. The dose to be graded according to the age of the animals:—

Lambs 3 months to 12 months—½ to 1½ ounces of solution.
Sheep over 12 months—2 to 3 ounces of the solution.

Dose a few sheep a few days before going ahead with the main mob in order to check the accuracy of the solution. This is merely a safeguard against possible error, which might cause mortality.

A good method of giving the drench is to procure some empty olive oil bottles, take each separately and mark where the dose comes to on it, then take a file and file a hole in the bottle at that point so that it will hold no more than the correct amount when dipped in the vessel containing the solution. No water should be given to the sheep on the day they are dosed. Sheep should be held in normal standing position when drenched.

Drenching should be done about every six weeks throughout the summer. The copper sulphate drench has proved to be very effective against stomach worms (particularly *Haemonchus contortus*), and should be given to all sheep on the property. The stomach worm is very widely distributed throughout the State, but it is only in certain districts that the conditions are favourable for heavy infestations.

General control measures as indicated above should also be enforced.

3.—LUNG WORMS.

There are two main species of lung worm infesting sheep in this State. These are *Dictyocaulus filaria* and *Synthetocaulus rufescens*. The former is found commonly in Western Australia; the latter, being much more infrequently encountered, is relatively unimportant. *Dictyocaulus filaria* lives in the branches of the windpipe (bronchi). On opening up the "pipes" the worms may be seen as white threads up to four inches in length, in cases of heavy infestation occurring in a tangled mass. The other species is smaller, and is found in the terminal branches of the bronchi and the lung tissue itself.

Symptoms.—Young sheep again are chiefly affected. The worms cause broncho-pneumonia with a rather characteristic dry cough, and frequent expulsion of mucus. There may be also some difficulty in breathing. Unless numerous, lung-worms have no effect on general health of sheep, the cough being practically the only symptom noted. If infestation is heavy there is loss of condition, and the sheep may become emaciated and die.

The fatal pneumonia, due primarily to the lung-worm, seen frequently in sheep in some parts of Australia, appears to be uncommon in the West.

Where lung-worms are present, stomach worms are occasionally found in association, and it would appear that the former are often of secondary importance; so that when sheep so affected are treated for stomach worm, symptoms of parasiticism disappear.

Life History.—This is similar to that of the stomach worm. The eggs or young worms are coughed up by affected sheep reaching the exterior with bronchial secretion, or are swallowed and passed out with faeces, thus infecting pastures. In a short time the worms which are swallowed by sheep migrate up the gullet into the mouth, and thence down the windpipe.

Treatment.—The general measures of control already suggested should be adopted. There is no really satisfactory treatment for lung worms that can be applied by the farmer, though if valuable stock are badly infested, there are certain measures which can be taken by a veterinarian with, perhaps, some measure of success.

If lung-worms are present it is as well to give the sheep the bluestone drench, not that this (or any other known drench) will remove the lung-worm, but it will remove stomach worms which are also likely to be present, and which may be actually causing the emaciation.

4.—OTHER ROUND WORMS.

Chabertia ovina is in our experience the most common worm affecting sheep in Western Australia, being found in almost 100 per cent. of *post mortems* in the Southern part of the State. It is a stout white worm up to one inch in length. It is found in the large bowel, usually firmly attached to the lining. No detrimental effects have been noticed here following infestation with this worm.

The "nodular worm" (*Oesophagostomum*) is occasionally met with. This worm gives rise to a condition of "pimply gut"—small nodules from the size of a pin head to that of a pea, being found in the large bowel. These nodules contain the larvae of the worm.

5.—TAPE WORMS.

There are numerous species of tape worms affecting sheep, which also harbour cysts or "bladders" of some species including hydatids. The mature worms are found in the intestines and, if numerous, segments may be obvious in the dung. The cysts are found commonly in the abdominal cavity and organs, and in the lungs.

As far as the sheep are concerned, tapeworms appear to be of quite minor significance, and their presence for all practical purposes has little effect on the general health of these animals.

6.—LIVER FLUKE.

It is noteworthy that the liver fluke does not exist in this State. It has been introduced here at different times in imported stock, but has never subsequently appeared in local sheep. Possibly this is due to the fact that the particular species of water snail required for the development of the parasite is not present in this State. The symptoms of stomach worm infestation are not unlike those due to chronic fluke infestation which accounts for the frequent opinion expressed by stock owners that their sheep are infested with liver fluke—in reality the trouble is probably due to stomach worms—certainly not to liver fluke.

BEE-KEEPING NOTES.

H. WILLOUGHBY LANCE,
Apiculturist.

This should be a busy time of year for bee-keepers. In many districts brood-rearing has been going on for the past two months, and in some cases the busy bee will have got ahead of the bee-keeper, the hives overcrowded, and swarming taken place.

Any bee-keeper who has not gone through his hives should do so at once, as no time is to be lost if he wishes to make the best of what promises to be a good season in most districts. The notes in last quarter's *Journal* on Hives and Swarming should be re-read.

Every hive should be examined, and, if dirty or dilapidated, exchanged for a clean sound one. In every case the brood chamber should be examined. If the bee-keeper finds that there is an excess of pollen combs choking the brood chamber, some of these should be removed, leaving from one to three combs of pollen, according to the strength of the hive and the amount of pollen available in the district for the bees to gather. If other hives are short, some of these combs should be given them. If there is still a surplus of pollen combs and no use for same, anyone communicating with me will be put in touch with a good market for the same.

This is a most important time of year for the apiarist, very much depending upon his management of the colonies at this time as to whether they are able to take full advantage of the honey flow when it comes along. His slogan should be "Strong colonies and hardy bees."

With further reference to *Hives*. The floor board illustrated in last issue may only be suitable for apiarists who keep their bees in home apiaries. When hives require to be removed from one place to another, I use a detachable alighting board.

The floor is cut off flush with the front of the hive body, and two clips made of 1in. hoop-iron nailed to the front of the 3in. x 1in. jarrah battens, with the top edge 1½in. from the floor. The detached portion of the floorboard has two strips of ½in. hoop-iron nailed to its battens, being bent slightly so that they will just enter the slips like hooks. (Fig. No. 1 shows this arrangement.) Another method of attaching these landing boards is with dowels, as shown in Fig. 2.

With this device it is an easy matter, when the hives are to be removed and loaded into a truck, to unhook the landing-board and fix a strip of flywire straight across the entrance. There are no projections to take up room or interfere with the loading, and the detached landings can easily be carried in any odd corner.

As regards bodies, although I gave particulars of how to make these from petrol cases, I would not recommend them in preference to factory-made bodies, being made of well-seasoned wood ⅞in. thick with corners well fitted and made to standard. They can be purchased for 5s. each for a 10-frame body in the flat, and will outlast petrol-case bodies. All joints should be put together with paint.

Now, with further reference to *Swarm Prevention.* It must be remembered the swarming is usually due to congestion in the hive, either with honey or brood choking the combs, or with bees covering them.

It is not always realised that imperfect combs intensify swarming. If the comb sags or is damaged, there is a number of imperfect cells, and these may be used for storing honey, but never for brood-rearing. Combs that have cracked or broken within an inch or two of the top bar form a barrier to the brood nest, and the brood capacity may be reduced from 10 to 7 or 8 frames. The top portion of the frames contain honey only, and although there may be an empty super on top, the bees, and especially the queen, hesitate to pass over this rim of honey. It is, therefore, always desirable

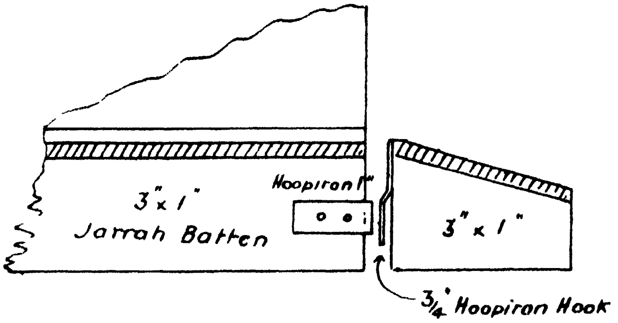


Fig 1.

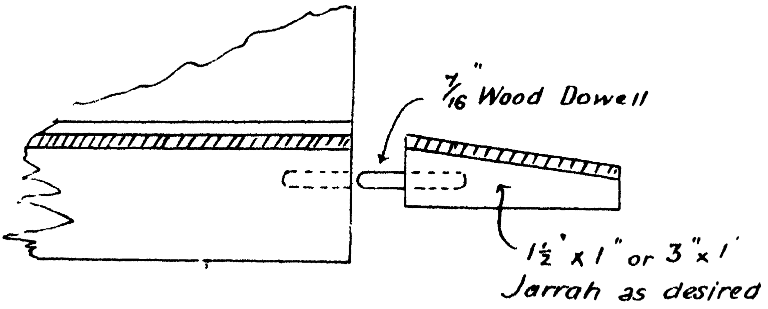


Fig 2

that especially the centre combs should have perfect worker cells right up to the top bar so that there is no contracting of the brood nest, and the queen and workers have no honey barrier to entering the second storey, causing congestion of bees in the brood chamber. Although there is plenty of room in the supers, the colony may be weak and will not pass the honey barrier, but crowds on to the brood combs.

Congestion is also brought about by weather conditions. Brood-rearing may be delayed. Good weather for nectar and pollen sets in, brood increases rapidly, and the colonies have a very large proportion of young bees which, being too young for field work, crowd the brood chamber if there is no inducement to enter the second storey. This inducement can be given by removing two or three frames of brood with the adhering bees from the lower storey and placing them in the second storey, replacing them with frames of foundation or drawn comb.

Intermittent rainy weather is more productive of excessive swarming than good weather with plenty of honey coming in, provided the bees have room to store it. Many a colony can by careful management be carried through the season without swarming if most of the hive-workers can be induced to occupy the supers, and conditions are such that the field workers spend most of their time in the fields.

Where increase of colonies is desired, there is a great saving of time both to the beekeeper and the bees if this increase is brought about by building up strong hives full of bees, preferably on two storeys of brood combs, and dividing up or making nuclei from same.

The usual method if the hive is divided is to make the hive on the old stand the queenless portion, removing the portion with the old queen to a new location, or it may be placed at the side of the old hive, in which case some of the returning field bees will find their way into each portion. If the queenless portion is to breed its own queen, a comb of eggs or young larvae from the most desirable queen in the apiary should be placed therein, in which case it is best to remove the portion with the old queen to a new site so that the queenless hive gathers all the field bees to keep this hive as strong as possible, as there will be no emerging brood from the new queen for about six weeks. If a young queen is available for introduction or can be purchased, all this delay will be obviated, and the breeding continued without intermission.

Honey.—After the bee-keeper has done all possible in the matter of hives, queens, and swarming prevention, he will naturally expect some return for his labour, and the real object of all this is honey, which he hopes will be the best quality. He should, therefore, watch the flora in his neighbourhood, and make himself acquainted with the source of his honey, occasionally sampling the honey stored in the combs so that if he finds that a poor or strong honey is stored in the early season, and that later there is prospect of, say, the wandoo or marri yielding a good surplus, it would be advisable to empty the supers before the wandoo and marri come in. If he is in a jarrah district he will probably find that the jarrah flow is finished by about Christmas, and he can take off the surplus leaving empty combs for any later flow. In my own district I usually get three or four distinctly different honeys during the year, which I endeavour to keep separate.

Beginners often have a great idea of producing comb honey in one-pound sections, and are greatly disappointed when, after having them on the hive for two or three months they find little or no honey in them. The production of comb honey is not an easy matter, and should not be attempted by a beginner but left until he understands more of the economy of the hive and the habits of the workers. I will deal with this on another occasion. If comb-honey is desired for home use, half-depth frames can be used in the supers and the comb cut out.

PEANUTS.

J. C. PALMER, Dip. Agr.,
Potato Inspector.

There is a big demand for peanuts amongst the fruiterers and merchants of Perth, more especially now the Commonwealth Government has placed restrictions on their import from Java and China. The roasted peanut is a very popular delicacy with certain sections of the public, large quantities of the raw nut are used used by the confectionery trade, and in addition valuable oils can be expressed from the nuts. This oil is used in the manufacture of oleo-margarine and in the United States, one of the countries where the pea-nut is grown extensively, large quantities are used annually. Peanuts can be grown in Western Australia though so far large acreages have not been planted. In the 1925-26 season only 3 acres were planted and a yield of 57 bushels was obtained. The local produce is, however, of quite a high quality and flavour, so that market gardeners and potato growers should find this crop worthy of their consideration.

The peanut belongs to a family of plants called legumes and shares with the other members of the family the peculiar property of absorbing nitrogen from the air. This nitrogen is drawn from the atmosphere and becomes converted by bacteria in nodules on the roots into plant food. As the vines die down the roots are left in the soil and consequently supplies of nitrogenous plant food are left in the soil for subsequent crops. Apart from any other considerations therefore, the cultivation of peanuts tends to increase the nitrogen content of the soil. Nitrogen forms the basis of one of the most important of plant foods and is usually supplied to the soil in the form of sulphate of ammonia a very costly manure. The soil is still more enriched—at the expense of the atmosphere—if the haulms are fed to stock on the paddock, or better still if the haulms are ploughed in after the nuts have been harvested.

According to the chemical analysis peanut haulms have a better food content than meadow hay. The kernel or nut has a very high feeding value since it contains generally about 29 per cent. of protein (nitrogenous feeding material) 49 per cent of fat and 14 per cent. of carbohydrates.

The peanut grows on low bushy plants with leaves like those of the Clover. It has an interesting peculiarity. The flowers after they have been fertilised, turn into pods and then the flower stalks with the bunch of immature pods bend over to the ground. The elongation of the end of the flower stalk and the whole of the cluster of young pods enter the ground, where they mature in close bunches. One or more seeds or nuts will form in each pod.

Seed and Cultivation.—The seed should be obtained from a reliable seedsman for most of the peanuts exposed for sale have been roasted. Roasting, of course, will kill the germination of the seed. The seed can be planted in the shells or husks but a more rapid germination will be obtained by shelling. When shelling, care must be taken not to rupture the skin of the nut. Only those shells which are well-grown and shapely should be selected for planting, and it is better to choose shells which contain two or more nuts in them. Whole seed (40-50lbs) or from 8-10 lbs of shelled nuts will plant an acre. This seed is priced at about 1s. per lb. The seed can be sown in the furrows, planting every third furrow or, say, at a distance of 3 feet between the rows and placed about 12 inches in the row at a depth of not more than 3 inches. In the United States the seed is planted with a maize planter. Under favourable conditions the seed should germinate in 7 to 12 days, and the crop should be ready for harvesting after about four months.

The soil must be left loose on top and thorough cultivations with horse scarifiers will keep the weeds down.

The plants do better if they are slightly hilled up. It is unwise to cultivate after the flowering organs of the plants have penetrated the soil and when the vines have spread between the rows.

It is usual to plant about September for then weather conditions are the most favourable.

Soil.—The main requirement is that the soil is of a free nature though the crop will grow in almost any type of soil. Though the upper layer must be well pulverised, it is not advisable to work the soil too deeply for the nuts tend to bury themselves and will be left behind in the digging unless great care is taken. The best peanuts grow in the lighter soils, for in such soils the shells have the rich golden yellow colour which the merchants prefer. Good potato land is excellent, and might be occasionally rotated with peanuts.

Manuring.—The most important plant foods for this crop are phosphoric acid and potash. It is not necessary to supply much nitrogen for the crop will obtain the bulk of its supplies of nitrogen from the air. The ordinary mixture supplied by the merchants for peas or beans is quite suitable for peanuts. A still better mixture is that known as "orchard mixture" which is put up by the Mount Lyell or Cuming Smith companies. This mixture contains a high percentage of potash (5 per cent.) and a fairly low nitrogen content. The manure can be applied as though one were manuring a potato crop—in the furrow at about the same rate.

Harvesting.—Peanuts are ready for harvesting when the vines begin to turn yellow and to dry up, more especially when the weather conditions are dry and warm. If the pods are not allowed to mature thoroughly before harvesting they will shrink in storage and the nuts will have a shrivelled appearance. Further, the nuts in green and unripe pods are less oily and are not of the same feeding value as those in the riper maturer shells.

In small areas it is better to dig the crop with a potato fork. When dealing with a large area the peanuts can be ploughed out, provided that the plough is set deep down, enough to cut the tap roots of the plants without injuring the pods which lie in clusters just under the soil. After the vines have been dug and laid in windrows they should be left to cure and dry in the sun. The rows can be turned occasionally to insure a thorough ripening and curing of the crop. When cured the nuts may be gathered into bran bags, carted to a shed and left for some while. This will minimise the chances of the kernels turning musty. Finally the crop is graded into sacks for disposal to the markets. The vines which are left in the paddock may be eaten off by stock or ploughed in.

There is machinery used in America for removing the shells from the plants but generally they are removed by hand. Hand shelling costs about 1s. per bushel. A yield of about 50 bushels per acre is often obtained and good peanuts will realise about 6d. or 7d. per lb. on the present market.

Varieties.—There are several varieties grown but most of them can be classed as white or red. The white are more spreading in habit and the red usually mature more slowly but give better returns. Well-known varieties are Small Spanish, Valencia, the Large Virginian and the Mammoth Bush.

SHOW AND FIELD DAY DATES, 1928.

Dalwallinu	Friday	Sept.	7, 1928
Jennapullin	Wednesday	Sept	12
Doodlakine	Wednesday	Sept.	12
Wyalkatchem	Friday	Sept.	14
Meckering	Friday	Sept.	14
Dowerin	Wednesday	Sept.	19
Bruce Rock	Wednesday	Sept.	19
Three Springs	Thursday	Sept	20
Quairading	Thursday	Sept.	20
Northampton	Thursday	Sept.	20
Tammin	Friday	Sept.	21
Goomalling	Friday	Sept.	21
Mt. Marshall	Saturday	Sept.	22
Greenough	Tuesday	Sept.	25
Northam	Tuesday and Wednesday	Sept.	25 and 26
Corrigin	Wednesday	Sept.	26
Geraldton	Thursday and Friday	Sept.	27 and 28
Kellerberrin	Friday	Sept.	28
Avondale, Field Day	Saturday	Sept.	29
Nungarin	Saturday	Sept.	29
Kulin	Saturday	Sept.	29
Lake Grace	Saturday	Sept.	29
Wongan Hills	Tuesday	Oct.	2
York	Wednesday	Oct.	3
Merredin	Thursday	Oct.	4
Moora	Thursday	Oct.	4
Perth Royal	Tuesday, Wednesday, Thursday, Friday and Saturday	Oct.	9 to 13
Chapman, Field Day	Saturday	Oct.	13

SHOW AND FIELD DAY DATES, 1928—*continued.*

Beverley	Tuesday	Oct. 16
Harrismith	Tuesday	Oct. 16
Pingelly	Wednesday	Oct. 17
Calingiri	Wednesday	Oct. 17
Narrogin	Thursday and Friday	Oct. 18 and 19
Merredin, Field Day	Friday	Oct. 19
Drakesbrook	Saturday	Oct. 20
Ghooli, Field Day	Saturday	Oct. 20
Byford	Saturday	Oct. 20
Nyabing	Saturday	Oct. 20
Wickepin	Tuesday	Oct. 23
Gnowangerup	Wednesday	Oct. 24
Harvey	Wednesday	Oct. 24
Toodyay	Wednesday	Oct. 24
Salmon Gums, Field Day	Friday	Oct. 26
Wagin	Friday	Oct. 26
Kelmscott	Saturday	Oct. 27
Kukerin	Monday	Oct. 29
Tambellup	Tuesday	Oct. 30
Katanning	Thursday and Friday	Nov. 1 and 2
Wongan Hills, Field Day	Friday	Nov. 2
Canning	Saturday	Nov. 3
Mt. Barker	Saturday	Nov. 3
Bunbury	Wednesday and Thursday	Nov. 7 and 8
Koojnup	Friday	Nov. 9
Upper Blackwood	Thursday	Nov. 15
Karridale	Saturday	Nov. 17
Catterick	Saturday	Nov. 17
Donnybrook	Wednesday	Nov. 21
Bridgetown	Friday	Nov. 23
Margaret River	Saturday	Nov. 24
Manjimup	Wednesday	Nov. 28
Albany	Thursday and Friday	Nov. 8 and 9
Osborne Park	Saturday	Dec. 1
Busselton	Wednesday	Dec. 5
Wanneroo	Saturday	Jan. 21, 1929
Kalamunda	Monday	Jan. 28
Denmark	Wednesday	Feb.
Coogee	Saturday	Feb. 16
Spearwood	Saturday	Feb. 23
Fremantle	Saturday	Mar. 2
Mandogolup		
Torbay		

HORTICULTURAL NOTES.

SEASONAL WORK FOR OCTOBER, NOVEMBER, AND DECEMBER.

GEO. W. WICKENS,
Superintendent of Horticulture.

October.

Cultivation in the orchards needs every attention this month. Ploughing and cross-ploughing will have been completed in September, and the cultivator must be kept going unless prevented by rain. Should rain occur the cultivator should be used again as soon afterwards as the land is dry enough to work without becoming sticky.

The winter rainfall of 1928 has been well up to the average in all fruit-growing districts, and if the top soil from four inches to six inches in depth is kept in a thorough state of tilth during the summer months, sufficient soil moisture will be retained for tree growth and fruit production, even should the summer turn out more than usually dry.

The land around the trees which cannot be reached with the cultivator or other horse-drawn implements must be freed from weeds, and loosened with a digging fork or pronged hoe.

Young trees in newly planted orchards require special attention, and hoeing should be lightly done so as not to disturb the roots which are now making new growth.

Insect pests and fungus diseases feel the genial effects of spring this month and reproduce abundantly, needing constant watchfulness and care to keep them under control. If in doubt as to treatment communicate with your local orchard inspector.

Pear Scab and Powdery Mildew of the apple, amongst the fungi, and Fruit Fly and Orange Aphis, amongst the insect pests, are some of the most important requiring attention at this time of the year. With reference to the first-named—Pear Scab—a regrettable typographical error occurred in the Horticultural Notes for September in the last *Journal* (June, 1928), where in the line at the bottom of page 253 advice is given to use lime sulphur at a strength of "1lb." lime sulphur in 40 gallons of water—"1lb." should read "1 gallon."

November.

Continue cultivation.

Continue baiting and trapping for Fruit Fly and destruction of infested fruit.

Spray for Pear Slug this month, using 1½ lbs. arsenate of lead powder in 50 gallons of water.

The first of the new season's stone fruits will ripen this month in the warmer districts—"Edward VII.," "Bell's November," and similar varieties of peaches being fit for gathering before the 30th. These varieties, if not well grown, are very poor in quality and appearance, and winter pruning should have been done with the idea of restricting the trees' production by the removal of a large proportion of the fruiting wood: but no matter how carefully and well winter pruning is carried out, it will be found in a normal season that thinning the young fruits is essential if size and quality are to be obtained. This refers not only to the fruits above mentioned, but to the major portion of the kinds of fruit now being grown, and I know of no single operation in the work on the orchard that is so generally neglected as thinning out young fruits, nor one that pays better when it is efficiently done. Fruit is sold by the pound or case in Western Australia, and just as many pounds or cases will be gathered from a tree that has been judiciously thinned as from one that has been allowed to overcrop: one fruit on the thinned tree equalling in size and weight two, and sometimes even three, on the tree that has overcropped. But quite apart from the fact that the quantity harvested is nearly the same, the large sized, good quality fruit will always find a market and command a price where the small hard fruit, lacking in juice and appearance, is difficult to dispose of at any price.

In thinning stone fruits—peaches, apricots and plums—the operation should be delayed until the natural shedding has taken place. If it is done before, many fruits will be removed by hand that would have fallen naturally. The shedding mentioned will be finished with nearly all varieties early this month. No hard and fast rule can be laid down as to the number to take off; the usual advice with peaches and apricots is to space the fruits to about four inches between them, but the trees rarely fruit evenly enough to allow of this being made an absolute rule. However, they should be thinned so that room is allowed each fruit to develop to the full size for the variety without touching its neighbour, and when the fruit is borne on lateral willowy growths, as distinct from short stiff shoots, care should be taken not to allow more weight of fruit at the ends than the wood can carry.

Apples and pears grow in clusters, at times as many as five together, and as a general rule these should be thinned to two in each cluster, but the operator must exercise judgment in this matter according to whether the variety is small or large, and whether the fruiting spurs are close together or a fair distance apart.

For the grower who is a novice at thinning and fears, when he looks at the ground after he has been at work on a tree for some time, that he has sacrificed too much of the crop the best plan by far is to count the fruits he has left on one of the main limbs, and gauging the strength of the limb and vigour of the tree he will know by the number of fruits whether he has taken too many or too few, calculating what number of the variety in question is required to fill a case when they reach maturity. I may say here that the beginner nearly always errs on the side of leaving too many on the tree.

In thinning apples and pears which, as stated above grow in clusters, care must be taken to remove the fruits and leave the stems attached to the spurs. If the stems are taken off with the fruits, the whole cluster is weakened, and the remaining fruits are liable to fall at a later date. With practice it is comparatively easy to take hold of an apple and bend it upwards in such a way that the stem parts readily from the fruit, but this can be done only if thinning is being carried out when the fruits are still quite small, or are naturally long-stemmed varieties. If they are short-stemmed like, for instance, "Jonathans," and the apples in the cluster are touching each other, it is nearly impossible to remove one with the fingers without endangering the safety of those left behind. A small pair of scissors with blunt points makes a useful tool; a lemon clips can also be used, or a sharp budding knife in skilful hands performs the work rapidly and well.

Keep a vigilant watch for traces of Codlin Moth, and report to the Department at once should any apples or pears show signs of having been tunnelled.

December.

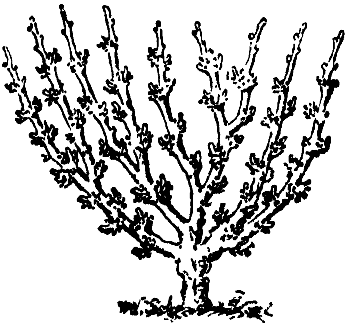
Continue cultivation.

Complete the work of thinning out apples and pears.

Carry on the war against Fruit Fly.

Take special notice of, and report at once, everything that resembles Codlin Moth or its larvae.

Marketing will be the principal work in the stone fruit orchards this month, and the better the fruit is graded and packed the better will be the prices obtained. Grade evenly and never mix small and large, nor first and second class fruit in one case, and never send to market very inferior fruit, which depresses prices of good fruit, causes gluts and robs the pigs which should be kept on the orchard of their just dues. It is very rare that a glut of really good fruit occurs, but there is always a very limited market for rubbish.



WHEAT VARIETY TESTS, 1927.

CHAPMAN EXPERIMENT FARM.

D. R. BATEMAN,
Seedsman.

YIELD TRIALS.

The method of conducting this experiment is identical with the "Junior Field Trial" of the Merredin Experiment Farm, as described in the "Journal of Agriculture" for March, 1927, Vol. 4, page 146, and is as follows:—"Each variety is planted with the farm seed drill 15 runs or tubes wide, but instead of, as in ordinary farm practice, each variety being sown through all the tubes or runs of the drill, it is sown through two of them only. The fertiliser applied and the rate of seeding were the same as those used for the main crops, and were 96 lbs. superphosphate (22 per cent.), and 45 lbs. seed per acre.

Each drill width is occupied by five varieties, with two rows of the well-known variety "Gluyas Early" planted on each side to act as control plots, and with which comparisons can be made. Each plot, as with the main Field Variety Trial, is 10 chains long.

Shortly after the germination of the seed this experiment plot was divided into 10 sections, each 87 links long, and two shorter buffer sections one at each end. Between each section there is a division 3 links wide, which was used as a pathway to facilitate observations being made during the course of the trial.

With the object of securing an indication of the ability of the varieties under trial to produce hay and grain, three of the short sections were reaped at the hay stage, and five of them harvested and thrashed for grain. The results in each case were compared with the outside control plots of "Gluyas Early." As the plots harvested are so small—1/640th of an acre—the results obtained cannot be accepted as reliable comparisons of the prolificacy of these varieties, but are useful, when the other characteristics are satisfactory, to indicate the desirability of including them in the usual Field Variety Trial.

The other two sections were allowed to remain in the field long after maturity in order to determine the strength of their straw, and their tendency to "shed."

In addition to the control variety—"Nabawa"—thirty varieties were included in this trial. Great care was taken with the preparation of this plot; double-gees (*Emex australia*) proved to be troublesome right up to the last cultivation, but were successfully eradicated with the disc cultivator

The experiment was planted in an ideal seed bed on the 25th May, and all varieties germinated well on the 2nd of June. Growth was fairly rapid at first, but with excessive rains during June and July several washes were noticed diagonally across nearly every plot; this retarded the growth somewhat, and was visible up till harvest time.

No frost of any importance was registered, and only a few varieties were infected with septoria sufficient to affect the grain yield.

Pink spotted grains were found in the following varieties:—C54 (Correll's No. 9x Minister), Ogilvie (Chapman 48), Ghurka P1713, Bena P1614, Alliance P1700, Patriot P1463.

The results obtained are as hereunder:—

GRAIN YIELDS.

Reg. No. P.	Name of Variety.	Average height when cut.	Grain Yields.					Average percentage of all Sections.
			Section A.	Section. C.	Section E.	Section G.	Section J.	
		ins.	ozs.	ozs.	ozs.	ozs.	ozs.	%
1432	Nabawa (Control) ...	42	7·25	11·50	16·00	16·25	12·00	100
1703	Mogul	43	9 00	14·25	23·77	15·75	11·75	111
...	C. 54 (Correll's No. 9 x Minister)	38	3·75	6·25	12 75	11 75	7·75	63
...	C. 56 (Currawa x Cowra 15)	37	9·75	14·25	24·75	19·50	14·25	123
..	C. 68 (Currawa x Gluyas Early)	42	6·25	11 00	20·75	15·25	13·50	100
1609	Nugget	40	9 25	13·25	19·00	16·50	11·75	104
1432	Nabawa (Control) ...	42	5·25	13·25	19·00	17·50	13·75	100
1432	Nabawa (Control) .	42	9·75	11·75	17·25	17·00	15·25	100
1702	Empire	38	2·00	4·25	7·35	9 25	4 75	42
1711	Viceroy	38	7·75	10·75	13·75	15 75	9 50	86
..	C. 61 (Federation x Bunyip)	40	8·75	13·25	18·00	16 25	10·25	99
1192	Ford	40	13·50	15·00	20·00	21·25	21·75	135
1696	Confederation	37	12·25	12·75	17·75	18·75	14·00	111
1432	Nabawa (Control) ...	44	7·25	7·75	16·25	17·25	14·75	100
1432	Nabawa (Control) ...	43	10·50	11·25	16·75	20·75	17·75	100
...	Ogilvie (Chapman No. 48)	42	6·25	8·75	13·25	16·75	13·00	76
...	C. 63 (Nabawa x Gluyas Early)	42	11·25	15·00	12·75	11·75	16·25	88
1713	Ghurkha	32	11·25	11·25	11·75	13·25	15·00	82
1614	Bena	38	10·25	8·75	15·00	17·75	13·25	86
...	M 3	40	12·25	14·25	25·25	24·00	15·25	120
1432	Nabawa (Control) ...	42	9·75	9·75	20·25	16·00	19·00	100
1432	Nabawa (Control) ...	40	8·75	15·25	15·25	23·25	14·25	100
1337	Gluyas Late	46	8·25	18·25	19·75	14·75	13·75	95
..	C. 47 (Minister x Toby's Tusk)	39	8·50	12·00	10·75	20·75	11·50	81
...	Bowes (Chapman No 49)	38	7·75	11·75	17·75	20·25	11·50	88
1700	Alliance	35	13·00	16·75	11·00	17·75	16·50	95
..	C. 62 (Nabawa x Gluyas Early)	37	6·25	13·75	15·50	22·00	13·75	91
1432	Nabawa (Control) ..	39	11·75	14·00	20·25	21·75	14·75	100
1432	Nabawa (Control) ...	43	11·75	16·00	19·75	21·75	13·25	100
...	C. 59 (Nabawa x Bunyip) II.	42	17·75	18·75	25·75	26·25	15·25	119
...	M. 4	42	15·25	15·75	21·00	25·25	14·25	105
1697	Ranee	33	13·75	18·25	21·75	20·25	10·25	96
...	C. 46 (Minister x Toby's Tusk)	37	21·25	15·75	15·75	20·25	13·50	99
..	C. 60 (Nabawa x Bunyip) III.	38	14·25	19·75	25·75	28·50	16·00	119
1432	Nabawa (Control) ...	41	9·75	18·50	23·25	25·00	15·75	100
1432	Nabawa (Control) ...	41	14·75	21·75	22·50	24·50	16·25	100
...	C. 52 (Nabawa x Gluyas Early)	39	17·25	20·50	24·75	26·25	18·25	118
...	C. 51 (Toby's Tusk x Gluyas Early) ...	35	15·75	20·50	24·00	27·25	18·75	117
...	C. 69 (Warren x Bayah)	40	15·75	20·25	25·25	28·00	16·25	116
1463	Patriot	39	14·25	18·25	17·50	23·75	16·25	100
...	M. 5	42	18·25	18·25	24·75	24·25	19·75	116
1432	Nabawa (Control) ...	44	7·75	14·00	18·25	25·00	16 50	100

HAY YIELDS.

Reg. No. P.	Name of Variety.	Average height when cut.	Weight of Hay cured.			Average percentage of all Sections.
			Section D.	Section F.	Section I.	
		ins.	lbs.	lbs.	lbs.	%
1432	Nabawa (Control)	42	2·25	3·00	2·50	100
1703	Mogul	41	2·75	4·75	3·50	116
...	C. 54 (Correll's No. 9 x Minister)	36	3·25	3·75	3·50	111
...	C. 56 (Currawa x Cowra 15)	37	3·75	4·75	3·50	126
..	C. 68 (Currawa x Gluyas Early)	40	3·75	5·50	3·75	137
1609	Nugget	44	3·25	4·50	3·50	118
1432	Nabawa (Control)	42	3·25	4·50	2·50	100
1432	Nabawa (Control)	44	3·00	3·00	2·00	100
1702	Empire	38	2·75	4·00	2·75	125
1711	Viceroy	34	3·00	4·25	2·75	131
..	C. 61 (Federation x Bunyip)	40	2·50	4·25	2·25	118
1192	Ford	46	3·00	4·20	3·50	144
1696	Confederation	39	2·75	4·50	2·75	131
1432	Nabawa (Control)	46	1·75	3·50	2·00	100
1432	Nabawa (Control)	44	2·25	3·00	2·00	100
.	Ogilvie (Chapman No. 48)	41	3·25	5·50	3·75	161
..	C. 63 (Nabawa x Gluyas Early)	45	3·00	3·50	2·50	116
1713	Ghurkha	36	2·25	3·25	2·50	103
1614	Bena	40	3·00	4·25	2·50	126
...	M 3	40	3·50	5·25	2·25	142
1432	Nabawa (Control)	45	2·25	4·00	2·00	100
1432	Nabawa (Control)	45	2·50	3·50	2·25	100
1337	Gluyas Late	50	3·75	5·00	3·00	138
.	C. 47 (Minister x Toby's Tusk)	44	3·00	3·00	2·50	100
.	Bowes (Chapman No. 49)	40	3·00	4·50	3·25	126
1700	Alliance	38	3·00	3·00	2·50	100
...	C. 62 (Nabawa x Gluyas Early)	42	3·25	3·75	2·00	106
1432	Nabawa (Control)	46	3·00	4·00	1·75	100
1432	Nabawa (Control)	46	2·75	3·00	2·00	100
	C. 59 (Nabawa x Bunyip) II	40	3·75	3·25	2·50	121
.	M 4	46	3·00	3·00	2·75	111
1697	Ranee	35	3·25	3·00	2·50	111
	C. 46 (Minister x Toby's Tusk)	42	3·25	2·75	2·50	105
.	C. 60 (Nabawa x Bunyip) III.	41	4·00	3·50	3·00	132
1432	Nabawa (Control)	46	3·25	2·75	2·00	100
1432	Nabawa (Control)	46	3·50	3·25	2·50	100
..	C. 52 (Nabawa x Gluyas Early)	42	4·00	3·75	3·00	132
..	C. 51 (Toby's Tusk x Gluyas Early)	40	4·25	3·50	3·00	132
	C. 69 (Warren x Bayah)	44	3·50	3·25	2·50	112
1463	Patriot	40	4·25	3·25	3·25	132
.	M 5	46	5·25	4·25	3·50	158
1432	Nabawa (Control)	44	3·25	3·25	1·75	100

BRIEF NOTES ON CHARACTERISTICS OF EACH VARIETY.

Alliance P1700.

Type.—White, square-tipped ear, bald, fairly short, stout straw that stands well, indifferent for hay, does not shed.

Diseases.—Susceptible to bunt, septoria on stem and ears moderate; spring rust on leaf blade very bad; summer rust on stem bad.

Maturity early.

Bena P1614.—A considerable amount of comment has been passed upon the good yielding qualities of this variety, but up to the present no extraordinary yields have been officially recorded; stools very well, but no better than Yandilla King under the same conditions.

Type.—Brown, slightly tapering ear, tip awned; straw stout and stands fairly well; not very suitable for hay, but should yield well; shed very little in this trial.

Diseases.—susceptible to bunt; septoria on stem and ears very slight; spring rust on leaf blade moderate, summer rust on stem bad.

Maturity midseason.

Bowes C49.—A variety that gave good promise at Merredin Experiment Farm when under trial in the Junior Field Trial there, but has not come up to expectations here.

Type.—White, tapering ear; tip awned; stout straw that stands fairly well; only fair hay qualities; grain poor, dark, discoloured; sheds slightly.

Diseases.—Susceptible to bunt; spring rust bad on leaf blade; summer rust very bad on stem.

Maturity midseason.

C46 (Minister x Toby's Tusk II.).—A variety that promised well in the Test Row plantings for both hay and grain.

Type.—White, tapering ear; tip awned; tall medium straw of good hay qualities, sheds rather badly; good sample of grain.

Diseases.—Resistant to bunt; septoria on stem and ears moderate; spring rust on leaf blade moderate; summer rust on stem slight.

Maturity midseason, slightly earlier than Nabawa.

C47 (Minister x Toby's Tusk III.).—A good hay variety, but failed to yield up to expectations for grain.

Type.—White, slightly tapering ear; tip awned; tall medium straw that stands fairly well; good hay variety; sheds rather badly.

Diseases.—Susceptible to bunt; spring rust on leaf blade bad; summer rust on stem moderate.

Maturity midseason.

C51. (Toby's Tusk x Gluyas Early III.).—A promising variety that yielded well for both hay and grain.

Type.—White, square-tipped ear; tip awned; medium stout straw; fairly good for hay; sheds very little.

Diseases.—Very susceptible to bunt; septoria on stem and ears very slight; spring rust on leaf blade moderate; summer rust on stem slight;

Maturity early.

C52 (Nabawa x Gluyas Early IV.).—A promising variety that yielded well for both hay and grain.

Type.—Brown, tapering ear; tip awned; medium straw that stands fairly well; good hay quality; does not shed.

Diseases.—Very susceptible to bunt; septoria on stem and ears very slight; spring rust on leaf blade bad; summer rust on stem very slight.

Maturity early.

C54 (Correll's No. 9 x Minister).—A disease-liable variety of no value for either hay or grain; very late and useless.

Type.—White, club-head ear; tip awned; stout, short straw that stands very well; poor hay quality; does not shed.

Diseases.—Very susceptible to bunt; septoria on stem and ear slight; spring rust on leaf blade bad; summer rust on stem very bad.

Maturity very late. Discarded.

C56 (*Currawa x Cowra* 15).—A promising variety for grain with fair hay yielding qualities.

Type.—White, clubbed ear; tip awned; fairly tall, stout straw that stands fairly well, only attained medium height under field conditions, fair hay qualities; does not shed.

Diseases.—Very susceptible to bunt; septoria present on stem and ears very slight; spring rust on leaf blade very slight; summer rust on stem moderate.

Maturity late.

C59 (*Nabawa x Bunyip II.*).—A very promising dual purpose variety very similar to Nabawa but slightly earlier.

Type.—White, tapering ear, with short tip awn; tall in the straw; stands well in the Test Row plantings, but lodged rather badly under field conditions, straw stout; fairly good hay qualities; does not shed.

Diseases.—Fairly resistant to bunt; septoria very slight on stem and ears; spring rust on ear blade and summer rust on stem plentiful.

Maturity early.

C60 (*Nabawa x Bunyip III.*).—A similar type to C59; both yielded well for hay and grain.

Type.—White, tapering ear, with short tip awn; medium straw that stood well in Test Row planting, but went down rather badly under field conditions; fairly good hay qualities; does not shed.

Diseases.—Very susceptible to bunt; septoria on stem and ears very slight; summer rust on stem plentiful.

Maturity early.

C61 (*Federation x Bunyip III.*).—A variety that at first showed promise in Test Row plantings, but failed under field conditions for both hay and grain; also very poor this season in Test Row planting.

Type.—Brown, tapering ear, bald; medium straw that stands fairly well, although tall; fairly good for hay but weighs light.

Diseases.—Fairly resistant to bunt; septoria on stem and ears very slight; very badly affected with spring rust on leaf blade; summer rust on stem plentiful.

Maturity midseason.

C62 (*Nabawa x Gluyas Early II.*).—A similar type to C52 but does not yield so well for either hay or grain; slightly later.

Type.—Brown, tapering ear, tip awned; medium straw that stands fairly well; fairly good hay qualities; does not shed.

Diseases.—Very susceptible to bunt; septoria on stem and ears slight; spring rust on leaf blade very plentiful; summer rust on stem plentiful.

Maturity midseason. Discarded.

C63 (*Nabawa x Gluyas Early III.*).—A promising variety that did not yield up to expectations for either hay or grain; similar to C62 and C52, but white glumed.

Type.—White, tapering ear, tip awned; fairly tall, medium straw that stands fairly well; rather good hay qualities; does not shed.

Diseases.—Very susceptible to bunt; septoria on stem and ears very slight; spring rust on leaf blade slight; summer rust on stem plentiful.

Maturity midseason. Discarded.

C68 (Currawa x Gluyas Early II.).—A fairly good hay variety that failed to come up to expectations for grain.

Type.—White, tapering ear, tip awned; tall, medium to stout straw that stands well; god hay qualities.

Diseases.—Very susceptible to bunt; septoria present on stem and ear slight; spring rust on leaf blade very slight; summer rust on stem plentiful.

Maturity late.

C69 (Warren x Bayah).—A variety that yielded well above expectations and far better than was estimated; it was most disappointing all through growth but yielded splendidly for grain.

Type.—White, square tipped ear, bald but rather compact; straw medium stout, stands well; better for grain than hay; sheds a little.

Diseases.- Susceptible to bunt; septoria on stem and ears very slight: spring rust on leaf blade very plentiful; summer rust on stem plentiful.

Maturity early.

Confederation P1696.—A grain variety from Werribee, Victoria, that showed promise in Test Row planting.

Type.—White, slightly clubbed ear, tip awned: stout straw that stands well; indifferent hay qualities; sheds a little.

Diseases.—Susceptible to bunt; septoria on stem and ears very slight; spring rust on leaf blade very plentiful; summer rust on stem plentiful.

Maturity early.

Empire P1702.—A short-strawed variety received from Werribee, Victoria, in 1925, and was included in the Junior Field Trial, as much was expected from these varieties.

Type.—Brown, slightly clubbed ear, tip awned; short stout straw that stood well in Junior Field Trial, but went down badly in Test Row planting; indifferent for hay; does not shed.

Diseases.—Very susceptible to bunt, spring rust on leaf blade plentiful; summer rust on stem plentiful.

Maturity midseason. Discarded.

Ford P1192.—A tall growing dual purpose variety, but sheds rather badly.

Type.—White, tapering ear, tip awned; tall, medium stout straw that stands fairly well, yields well for hay and of good quality; good for grain, but sheds rather badly.

Diseases.—Spring rust on leaf blade moderate; summer rust on stem slight.

Maturity midseason.

Ghurkha P1713.—A variety received from Werribee, Victoria, in 1925; does not yield well for either hay or grain; possesses a good stiff short straw.

Type.—Brown, square tipped ear, tip awned; short stout straw that stands well; very poor hay qualities; does not shed.

Diseases.—Resistant to bunt; loose smut on several plants; septoria on stem and ears slight; spring rust on leaf blade moderate; summer rust on stem moderate.

Maturity midseason. Discarded.

*Gluyas Late P*1337.—A tall growing variety suitable for hay, but does not yield well for grain.

Type.—Brown, tapering ear, tip awned; tall fairly stout straw that is inclined to go down; good hay variety; does not shed.

Diseases.—Fairly susceptible to bunt; spring rust on leaf blade bad: summer rust on stem moderate.

Maturity midseason. Discarded.

M3 (*Toby's Tusk x Nabawa.*)—A tall growing variety that yielded well both for hay and grain.

Type.—White, slightly clubbed ear, tip awned; tall, stout straw that stands fairly well, good hay qualities; yielded good sample of grain; sheds a little.

Diseases.—Moderately susceptible to bunt; spring rust on leaf blade bad; summer rust on stem very bad.

Maturity midseason.

M4 (*Steinwedel x Cedar*).—A very fair dual purpose variety, but is rather weak in the straw.

Type.—White, clubbed ear, tip awned; fairly tall, stout straw, but goes down badly; good hay qualities; does not shed.

Diseases.—Septoria on stem and ears slight; spring rust on leaf blade plentiful; summer rust on stem moderate.

Maturity early.

M5 (*Huguenot x Bunyip*).—A tall growing early variety that is better suited for hay than grain.

Type.—White, tapering ear, tip awned; medium straw that stands very well; good hay qualities, but sheds far too badly to be of any value for grain.

Diseases.—Fairly resistant to bunt; septoria on stem and ears slight; spring rust on leaf blade bad; summer rust on stem slight.

Maturity early.

*Mogul P*1703.—A variety that was received from Werribee, Victoria, in 1925, and showed fair promise in Test Row plantings.

Type.—Brown, square tipped ear, tip awned; fairly tall stout straw that stands fairly well; fairly good hay qualities; sheds rather badly.

Diseases.—Very susceptible to bunt; spring rust on leaf blade bad; summer rust on stem bad.

Maturity late. Discarded.

Nugget P1609.—A late variety that failed to yield up to expectations from results in Test Row plantings.

Type.—White, square tipped ears, with slight tip awn; fairly tall, stout straw that stands well; fairly good for hay; sheds slightly.

Diseases.—Very susceptible to bunt; septoria on stem and ears very slight; spring rust on leaf blade plentiful; summer rust on stem plentiful.

Maturity late, but slightly earlier than Yandilla King.

Ogilvie C48.—A variety that promised well at Merredin Experiment Farm, but has not come up to expectation; did not do very well here this season either in the Junior Field Trial or Test Row Plantings.

Type.—Brown, tapering ear, tip awned; fairly tall stout straw that stands fairly well; useful for hay; sheds slightly.

Diseases.—Moderately susceptible to bunt; septoria on head and stem very slight; spring rust on leaf blade moderate; summer rust on stem plentiful.

Maturity midseason.

Patriot P1463.—An early variety that did not yield up to expectations for grain.

Type.—White, tapering ear, bald, fairly tall medium straw; fairly good hay qualities, but sheds too much to be of any value as grain yielder.

Diseases.—The most susceptible variety for bunt at present under list; septoria on stem and ears slight; spring rust on leaf blade very bad; summer rust on stem very bad.

Maturity early.

Ranee P1697.—A short-strawed variety that did not come up to expectations in this year's test.

Type.—Brown, tapering ear, tip awned; stout straw that stands well; indifferent for hay; sheds rather badly.

Diseases.—Moderately susceptible to bunt; septoria on stem and ears slight; spring rust on leaf blade plentiful; summer rust on stem moderate.

Maturity early.

Viceroy P1711.—A variety received from Werribee, Victoria, in 1925, that failed to yield up to expectations.

Type.—Brown, tapering ear, bald; medium straw that stands fairly well; indifferent for hay; does not shed.

Diseases.—Very susceptible to bunt; septoria slight on stem and ears; spring rust on leaf blade slight; summer rust on stem moderate.

Maturity midseason. Discarded.

BUNT RESISTANCE.

Trials to determine the relative Bunt Resistance of some new varieties were conducted on similar lines to those carried out at the Merredin Experiment Farm.

The results arranged in order of relative susceptibility are as hereunder. The rate of infection of the Control—"Gluyas Early" is represented by 100 and freedom from infection by O.

VARIETIES ARRANGED IN ORDER OF INFECTION COMPARED WITH CONTROL ROWS.

Degree of Infection (0)—
P. 1511, Genoa ; P 1211, Kubanka ; P. 1713, Ghurkha.

Degree of Infection (1–20)—
P. 1705, Nabob 5 ; P. 1773, Early Bird 10 ; P. 1756, Wardfir 12 ; P. 1635, Nizam, 13 ; P. 1451 (Bunge No. 1 x Emmer) 13 ; P. 1779, Bluestem (identified as "Nabawa ") 19.

Degree of Infection (21–50)—
P. 1741, Omrah 23 ; P. 1706, Krithia 25 ; P. 1709, Marmora 25 ; P. 1746, Minyip 25 ; P. 1715, Babakin 27 ; P. 1697, Ranee 27 ; P. 1512, Felix 27 ; P. 1714, Gallipoli 28 ; P. 1695, Sepoy 29 ; P. 1803, Ogilvie 29 ; P. 1727, Booroloo 35 ; P. 1696, Confederation 35 ; P. 1804, Bowes 36 ; P. 1614, Bena 40 ; P. 1182, Wandilla 40 ; P. 1188, Cowra 26, 42 ; P. 1700, Alliance 45 ; P. 1710, Rajah 50 ; P. 1786, Riverina 50.

Degree of Infection (51–100)—
P. 1337, Gluyas Late 52 ; P. 1752 (Currawa x Minister) 52 ; P. 1637, Wannon 55 ; P. 1609, Nugget 56 ; P. 1736, Boono 56 ; P. 1785, Aussie 60 ; P. 1748 (Currawa x Minister) 60 ; P. 1536, Barwang 62 ; P. 1610, Akakomuga 67 ; P. 1602, Crossbred 78a 68 ; P. 1711, Viceroy 70 ; P. 1708, Mahratta 70 ; P. 1513, Onas 77 ; P. 1776, Dollar 77 ; P. 1461, Soutar's Early 79 ; P. 1750, Inderet 80 ; P. 1744, Dookie Delta 83 ; P. 1627, Waratah 84 ; P. 1754, Gluclub 86 ; P. 1601 Crossbred (No. 12) 87 ; P. 1702, Empire 87 ; P. 1449 Bunge No. 1 x 1 P. 4 87 ; P. 1777, Union 87 ; P. 1199, Sultan 87 ; P. 1728, Cadia 88 ; P. 1774, Duri 90 ; P. 1775, Bredbo 90 ; P. 1703, Mogul 91 ; P. 1729, Canimbla 92 ; P. 1606, Unnamed x Una 92 ; P. 1698, Capitol 93 ; P. 1712, Sterling 95 ; P. 1704, Sovereign 95 ; P. 1749 Federation x Nabawa 95 ; P. 1434, Booran (Control) 100 ; P. 1726, Bobin 100 ; P. 1787, Gluclub 102 ; P. 1382, Triumph 106 ; P. 1739, Exquisite 113 ; P. 1701, Parseo 116 ; P. 1755 Federation x 1878 118 ; P. 1770, Millard 121 ; P. 1463, Patriot 127.

NEW CROSSBREDS ARRANGED ACCORDING TO INFECTION AS COMPARED WITH CONTROL.

Degree of Infection (0)—
C. 46 (Minister x Toby's Tusk III.) ; C. 55 (Jonathan x Minister I.) , C. 74 (D.A.C. 4179 x Quality III.) ; C. 80 (Dindiloa x Nabawa (M)) ; C. 86 (Quality x Velvet Don III.) ; M. 11 (Comeback x Florence) ; M. 28 (Dindiloa x Nabawa I.) ; M. 29 (Dindiloa x Nabawa II.) ; M 30 (Dindiloa x Nabawa III.) ;.

Degree of Infection (1–20)—
M. 27 (Nabawa x Carrabin III.) 2 ; C. 77 (Florence x Carrabin (M)) 2 ; C. 73 (D.A.C. 4179 x Quality II.) 3 ; C. 79 (Fortune x Gluyas Early III.) 3 ; C. 81 (Florence x Nabawa (M)) 5 ; C. 57 (Currawa x Gluyas Early I.) 6 ; C. 76 (Minister x Toby's Tusk I.) 7 ; C. 60 (Nabawa x Bunyip III.) 9 ; M. 32 (Florence x Fortune) 9 ; M. 24 (Florence x Carrabin) 11 ; M. 33 (Florence x Nabawa) 11 ; M. 25 (Nabawa x Carrabin I.) 16 ; M. 26 (Nabawa x Carrabin II.) 20.

Degree of Infection (21–50)—
C. 61 (Federation x Bunyip III.) 21 ; C. 59 (Nabawa x Bunyip II.) 23 ; M. 23 (Federation x Carrabin) 24 ; C. 70 (Federation x Bunyip IV.) 26 ; C. 65 (Huguenot x Indian V.) 29 ; C. 83 (D.A.C. 4179 x Nabawa II.) 32 ; C. 85 (D.A.C. 4179 x Nabawa IV.) 39 ; C. 69 (Warren x Bayah) 42 ; M. 31 (Gluyas Early x Nabawa), 47 ; C. 47 (Minister x Toby's Tusk II.) 50.

Degree of Infection (51–100 and over)—
C. 52 (Nabawa x Gluyas Early IV.) 52 ; C. 62 (Nabawa x Gluyas Early I.) 60 ; C. 63 (Nabawa x Gluyas Early III.) 63 ; C. 53 (Gluyas Early x Bunyip II.) 66 ; C. 68 (Currawa x Gluyas Early II.) 69 ; C. 56 (Currawa x Cowra 15) 72 ; C. 51 (Toby's Tusk x Gluyas Early III.) 77 ; C. 66 (Hd. Federation x Gluyas Early II.) 83 ; C. 64 (Indian 7 x Currawa) 84 ; C. 84 (D.A.C. 4179 x Nabawa III.) 85 ; C. 67 (Toby's Tusk x Nabawa III.) 92 ; C. 50 (Toby's Tusk x Gluyas Early I.) 102 ; C. 75 (Correll's No. 9 x Minister x Quantity I.) 103 ; C. 78 (Clubhead x Vindessa IV.) 110 ; C. 54 (Correll's No. 9 x Minister I.) 114.

WHEAT VARIETY TESTS, 1927.

MERREDIN EXPERIMENT FARM.

E. J. LIMBOURN,
Seedsman.

FLAG SMUT RESISTANCE.

This experiment was carried out as a means of gaining definite information regarding the resistance of wheat varieties to the attack of the disease—Flag Smut (Urocystis tritici).

It was originally intended to test each variety for a period of three years. Owing to the large number of new varieties received annually, it has been found impossible to do this. In order to keep the work up to date with regard to new varieties, and yet keep within the area allotted, it has been found necessary to condense the experiment by—

(1) Omitting varieties already tested that had given over 25 per cent. of infection. (For 1928 it is proposed to limit this to 20 per cent):

(2) Reducing the seeds planted per row to 50:

(3) Planting the seeds only ½ a link apart, thus making the rows only ¼ of a chain long:

(4) Reducing the space between the rows to 2 links instead of 2¼ links.

(5) Omitting varieties that are included in the line resistance test, that is omitting all the main crop varieties.

The number of varieties tested during 1927 was 108, which included 31 unnamed crossbreds from the Chapman Experiment Farm, and 18 unnamed crossbreds from this farm.

The majority of the named varieties were received during the last three years, only twenty-six of them had been planted during the previous year's test, which consisted mainly of the older and better known varieties.

The seed for this experiment is infected in much the same way as for the Bunt resistance test. To obtain the spores of the disease, infected foliage is collected at harvest time from a diseased crop, and minced up finely into a powder. The material was supplied by Mr. Carne, Botanist and Plant Pathologist, Department of Agriculture, Perth. A spoonful (small) of this minced straw is placed in each packet of 50 seeds and the packet well shaken up. The spores adhere readily to the seed, but to ensure a maximum infection a small pinch of the minced straw is pressed into the soil with each grain, and also sprinkled along the row before covering the seed.

Planting was delayed until early in June, the soil being then in fairly good condition, free from weeds but inclined to be cloddy.

Germination was only fair, averaging about 80 per cent. due possibly to cloddy soil, although in some cases there was evidence of the seedling Foot-rot.

No evidence of Flag Smut could be found until early September when the plants began to break into ear. The first inspection was made about September 16th, when all diseased plants were pulled out. After being counted and noted in the Field Book the plants were burnt. Another inspection was made during November, the majority of the varieties being then mature. All diseased plants were again pulled out and counted. The diseased flag from these plants was then collected and placed in air-tight tins for future experiments, the remainder of the plant being burnt.

Taking the average percentage infection of the control rows for the two years, it is found that the infection for 1927 is considerably higher than for 1926. The rates were 35 per cent. in 1926 and 49 per cent. in 1927. It would appear therefore that the method of infecting the seed is quite satisfactory.

A comparison of the result for those varieties that have been included both years is given herewith—

A COMPARISON OF THE PERCENTAGE OF INFECTION WITH VARIETIES PLANTED BOTH YEARS.

"GLUYAS EARLY" = 100.

Reg. No.	Variety.	1926.	1927.	Reg. No.	Variety.	1926.	1927
		%	%			%	%
859	Baroota Wonder Early	0	0	226	Yandilla King	0	0
421	Bunyip	0	0	1710	Rajah (Victoria)	2	4
914	Caliph	0	6	1507	Clarendon	3	7
.	Carrabin	0	1	C46	(Minister x Toby's Tus	3	4
223	Florence	0	0	228	Comeback	3	0
1442	Geeralying	0	0	1696	Confederation	3	
M3	(Toby's Tusk x Nabawa)	0	6	920	Toby's Tusk	3	16
...	Nabawa	0	0	C52	(Nabawa x Gluyas Early)	5	74
M14	(Nabawa x Bunyip)	0	0	1038	Greeley	6	11
M18	(Federation x Bunyip)	0	4	1636	Gallipoli	9	21
M19	(Nabawa x Sunset)	0	0	1713	Ghurka (Victoria)	11	9
1194	Queen Fan	0	0	955	Newman's Early	12	5
1445	S. H. J.	0	6	1697	Ranee	17	12
1182	Wandilla	0	0	460	Federation	18	47

It will be noticed that most of the varieties which were resistant in 1926 were also resistant in 1927. There were 13 resistant varieties in 1926, and of these only 4 showed infection in 1927, the infection being only very light. Two varieties that were slightly infected in 1926 were quite clean in 1927, although in most of the other varieties the infection was heavier. In looking up the pedigree of some of the resistant varieties it was found that one variety "Improved Fife" had been used in the breeding of at least five of them. They were all either directly the result of crosses made by the late William Farrer, or can be traced back to varieties bred by him. "Comeback," "Genoa," "Florence," and "Bunyip" are four Farrer crosses, and "Yandilla King" can be traced back to him through "Yandilla." "Nabawa," "Carrabin," and "Dindiloa" can be added to these as they include either "Bunyip" or "Florence" in their parentage. No means are now available of determining whether "Improved Fife" is or was actually resistant, but the above information is certainly interesting as pointing that way.

It is very evident that the resistance is very strongly inherited in the progeny of either "Bunyip" or "Florence." In testing the new crossbreds from both experiment farms it will be seen that 23 out of 34, having either one or other of these varieties in the parentage, were fully resistant, while 9 of the remainder came below 20 per cent.

Several of the Chapman crossbreds had been treated with copper carbonate before it was found possible to include them in the test. These were thoroughly washed and dried before being infected, but there is no evidence at present to show whether this treatment had any effect upon the results obtained.

"Genoa" and M.11 (Comeback and Florence), both of which have proved so resistant to Bunt, also appear amongst the resistant varieties in this test. "Baroota Wonder Early" and "Geeralying" both again show resistance. In view of their usefulness as hay varieties this is worth noting as the use of a resistant hay variety should do much to stop the spread of the disease.

The varieties arranged according to their susceptibility to Flag Smut are as hereunder. The rate of infection of the control—"Gluyas Early"—is represented by 100 and freedom from infection by O.

Degree of Infection (0)—

P. 859, Baroota Wonder Early; P. 421, Bunyip; P. 228, Comeback; P. 1696, Confederation; P. 1739, Exquisite; P. 223, Florence; P. 1749, (Federation x Nabawa); P. 1442, Geeralying; P. 1750, Inderet; P. 1511, Genoa; P. 1194, Queen Fan; P. 1182, Wandilla; P. 226, Yandilla King; P. 1432, Nabawa.

Degree of Infection (1–20)—

P. 1437, Carrabin 1; P. 1710, Rajah (Victoria) 4; P. 1786, Riverina 4; P. 955, Newman's Early 5; P. 914, Caliph 6; P. 1769, Noongaar 6; P. 1445, S.H.J. 6; P. 1756, Wardfir 6; P. 1736, Boonoo 7; P. 1507, Clarendon 7; P. 1792, Joffre 7; P. 1704, Sovereign 7; P. 1695, Sepoy 7; P. 1183, Ghurka (Victoria) 9; P. 1776, Dollar 9; P. 1038, Gresley 11; P. 1744, Dookie Delta 12; P. 1697, Ranee 12; P. 1706, Krithia 12; P. 920, Toby's Tusk 16; P. 1774, Duri 17; P. 1429, Golden King 17; P. 1775, Bredbo 19; P. 1787, Gluclub (Smith & Sons) 20.

Degree of Infection (21-50)—

P. 1636, Gallipoli 21; P. 1727, Boolaroo 21; P. 1729, Canimbla 21; P. 1754 Gluclub (Victoria) 22; P. 1726, Bobin 24; P. 1746, Minyip 31; P. 1773, Early Bird 32; P. 1699, Suvla 37; P. 1788, Cargo 43; P. 460, Federation 47; P. 1708, Mahratta 47; P. 1705, Nabob 49.

Degree of Infection (51-100)—

P. 1785, Aussie 52; P. 1700, Alliance 52; P. 1440, Merredin 58; P. 1741, Omrah 59; P. 1789, Binya 63; P. 1609, Nugget 69; P. 1790, Bruce 71; P. 1709, Marmora 76; P. 1698, Capitol 85; P. 1777, Union 85; P. 709, Canberra 95; P. 1702, Empire 96; P. 1363, Gluyas Early (Control) 100; P. 1728, Cadia 108.

NEW CROSSBREDS ARRANGED ACCORDING TO COMPARATIVE PERCENTAGE OF CONTROL VARIETY.

DEGREE OF INFECTION (0)—

C54 (Correll's No. 9 x Minister); C. 59 (Nabawa x Bunyip); C. 60 (Nabawa x Bunyip); C. 61 (Federation x Bunyip); C. 62 (Nabawa x Gluyas Early); C. 64 (Indian 7 x Currawa); C. 65 (Huguenot x Indian 5); C. 68 (Currawa x Gluyas Early); C. 70 (Federation x Bunyip); C. 73 (D.A.C. 4179 x Quality); C. 74 (D.A.C. 4179 x Qaulity); C 77 (Florence x Carrabin); C. 79 (Fortune x Gluyas Early); C. 80 (Dindiloa x Nabawa); C. 81 (Florence x Nabawa); C. 84 (D.A.C. 4179 x Nabawa); C. 85 (D A.C. 4179 x Nabawa); M.11 (Comeback x Florence); M. 14 (Nabawa x Bunyip); M. 19 (Nabawa x Sunset); M. 24 (Florence x Carrabin); M. 25 (Nabawa x Carrabin); M. 26 (Nabawa x Carrabin); M. 27 (Nabawa x Carrabin); M. 28 (Dindiloa x Nabawa); M. 29 (Dindiloa x Nabawa); M. 30 (Dindiloa x Nabawa); M33 (Florence x Nabawa).

DEGREE OF INFECTION (1–20)—

M. 31 (Gluyas Early x Nabawa) 3; C. 46 (Minister x Toby's Tusk) 4; C. 56 (Currawa x Cowra 15) 4; M. 18 (Federation x Bunyip) 4; M. 20 (Nabawa x Gluyas Early) 4; M. 23 (Federation x Carrabin) 4; M. 3 (Toby's Tusk x Nabawa) 6; C. 75 (Correll's No. 9 x Minister x Quality) 8; C. 67 (Toby's Tusk x Nabawa) 9; M. 21 (Natural x B. from Federation) 9; M. 32 (Florence x Fortune) 10; C. 53 (Gluyas Early x Bunyip) 18.

DEGREE OF INFECTION (21–50)—

C. 51 (Toby's Tusk x Gluyas Early) 21; C. 76 (Minister x Toby's Tusk) 24; C. 50 (Toby's Tusk x Gluyas Early) 26; C. 69 (Warren x Bayah) 26; C. 78 (Clubhead x Vindossa) 26; C. 63 (Nabawa x Gluyas Early) 45.

DEGREE OF INFECTION (51–100)—

C. 52 (Nabawa x Gluyas Early) 74; C. 66 (Hd. Federation x Gluyas Early) 75; C. 57 (Currawa x Gluyas Early) 80; "Gluyas Early" (Control) 100.

FLAG SMUT RESISTANCE TEST WITH "LINES" OF STANDARD VARIETIES.

To test the variation in resistance between the "lines" of the same variety, and the possibility of producing a resistant strain by selection, twenty-five plants were selected from each of the varieties grown in bulk on the farm.

The plants representing the "lines" were obtained from the selection rows of each variety, fifty grains from each plant being used for the test. These were infected with Flag Smut in the usual way.

In the case of the variety "Gluyas Early" 50 "lines" were selected from the bulk crop in order to ascertain whether there was a greater variation in the resistance between these "lines" than between those which had been subjected to continuous selection for some time. The results show that there was a greater variation. In the case of the "lines" from selected plants the variation ranged from 27 to 60, average 42, and in the case of the "lines" from the bulk crop the range was from 14 to 70, average 41.

The results obtained are as hereunder—

Gluyas Early.					Canberra.	Nabawa.	Merredin.	Noongaar.	Carrabin
Selected ears from Bulk Crop.				Plants from selection rows.					
Line	Percentage infected.	Line	Percentage infected.	Percentage infected.	Percentage infected.	Percentage infected.	Percentage infected.	Percentage infected.	Percentage infected.
1	37	26	30	53	32	0	25	6	0
2	28	27	48	29	37	0	24	0	0
3	38	28	53	50	47	0	20	4	0
4	57	29	28	32	47	0	19	0	0
5	31	30	43	51	49	0	40	4	0
6	33	31	31	42	59	0	21	0	3
7	42	32	28	40	54	0	18	4	0
8	32	33	56	34	34	0	21	0	0
9	28	34	24	60	34	0	21	4	0
10	37	35	39	42	50	2	17	8	0
11	35	36	63	51	37	0	16	0	0
12	44	37	37	47	37	0	28	0	0
13	44	38	54	39	44	0	19	0	3
14	35	39	47	27	44	0	21	0	0
15	27	40	43	43	29	0	33	10	0
16	27	41	59	38	33	0	41	4	0
17	37	42	53	47	34	0	36	0	6
18	57	43	45	33	37	0	28	0	0
19	60	44	37	37	31	0	28	0	0
20	39	45	41	47	28	0	29	0	0
21	32	46	70	53	55	0	27	4	0
22	14	47	45	53	47	0	21	0	0
23	37	48	31	43	49	0	23	0	0
24	61	49	25	41	38	0	25	10	0
25	57	50	39	44	37	0	33	0	0
Average ..		..	41	42	41	Much less than 1	25	3	Approx. ·5 %.

In this and previous trials with Flag Smut it has been the practice to allow the surplus material with which the grain is infected to remain with it until the seed is being planted, there is then serious risk of this light infected material being blown about, and as the disease is soil-borne, of spreading infection to locations where it is not desired.

A test made this season has shown conclusively that this surplus infected material is not at all necessary to ensure the infection of the grain under trial, and in future it will be sieved off.

BUNT RESISTANCE.

This experiment, which has been planted for several seasons, was originally dsigned to obtain definite information as to the resistance or liability of certain varieties to the attack of Bunt (Tilletia levis). Having obtained definite information on this point regarding the older varieties in cultivation, it is now limited mainly to testing the resistance or liability of any new variety received.

It is planned on the same lines as the Flag Smut resistance test. There being little or no danger of wind-borne or soil infection with this disease, it can be safely planted with the main test rows. For this reason it is possible to make the rows 1 chain long, and plant 100 grains of each variety per row. Each year any variety with more than 20 per cent. infection when compared with the control variety is to be discarded. Varieties with less than 20 per cent. infection will be included in the following season's test and continued for at least three seasons unless the rate of infection rises above 20 per cent.

It will be noticed that very successful results have been obtained with the variety "Florence" as a parent. Six of the new crossbreds included in the test, with an infection of less than 20, are crosses with "Florence," and one other can be traced to "Florence" through the variety "Dindiloa." Only three crossbreds other than these are amongst those below 20.

The results obtained are as under—

VARIETIES ARRANGED IN ORDER OF INFECTION COMPARED WITH CONTROL ROWS.

DEGREE OF INFECTION (0)—
P. 1511, Genoa.

DEGREE OF INFECTION (1-20)—
P. 1713, Ghurka 14 ; P. 1705, Nabob 15.

DEGREE OF INFECTION (21–50)—
P. 1756, Wardfir 21 : P. 1699, Suvla 23 ; P. 1744, Dookie Delta 30 ; P. 1706, Krithia 31 ; P. 1750, Inderet 32 ; P. 1709, Marmora 36 ; P. 1746, Minyip 39 ; P. 1727, Boolaroo 47 ; P. 1708, Mahratta 47 ; P. 1451, (Bunge No. 1 x Emmer) 49.

DEGREE OF INFECTION (51–100 and over)—
P. 1777, Union 52 : P. 1774, Duri 54 ; P. 1695, Sepoy 55 : P. 1785, Aussie 61 ; P. 1786, Riverina 61 ; P. 1736, Boonoo 65 ; P. 1627, Waratah 66 ; P. 1636, Gallipoli 67 ; P. 1775, Bredbo 70 ; P. 1773, Early Bird 71 ; P. 1711, Viceroy 71 ; P. 1726, Bobin 72 ; P. 1788, Cargo 73 ; P. 1739, Exquisite 76 ; P, 1614, Bena 76 ; P. 1710, Rajah 76 ; P. 1697, Ranee 76 : P. 1790, Bruce 78 ; P. 1741, Omrah 78 ; P. 1792, Joffre 80 ; P. 1702, Empire 81 ; P. 1729, Canimbla 82 ; P. 1749, (Federation x Nabawa) 82 ; P. 1700, Alliance 88 ; P. 1429, Golden King 88 ; P. 1701, Parsee 89 ; P. 1789, Binya 89 : P. 1787, Gluclub (Smith & Son) 92 : P. 1463, Patriot 93 ; P. 1704, Sovereign 94 ; P. 1696, Confederation 95 ; P. 1182, Wandilla 97 ; P. 1703, Mogul 98 ; P. 1712, Sterling 98 ; P. 1698, Capitol 100 ; P. 1776, Dollar 100 ; P. 1434, Booran (Control) 100 ; P. 1609, Nugget 101 ; P. 1754, Gluclub (Victoria) 105 ; P. 1728, Cadia 107.

NEW CROSSBREDS ARRANGED ACCORDING TO INFECTION AS COMPARED WITH CONTROL.

DEGREE OF INFECTION (0)—
C. 73 (D.A.C. 4179 x Florence) ; C. 74 (D.A.C. 4179 x Florence) ; C. 80 (Dindiloa x Nabawa) ; C. 86 (Florence x Velvet Don).

DEGREE OF INFECTION (1–20)—
M. 11 (Comeback x Florence) 1 ; C. 79 (Fortune x Gluyas Early) 9 ; C. 77 (Florence x Carrabin) 10 ; C. 46 (Minister x Toby's Tusk) 13 ; C. 81 (Florence x Nabawa) 14 ; C. 65 (Huguenot x Indian 5) 15.

DEGREE OF INFECTION (21–50)—
C. 59 (Nabawa x Bunyip) 25 ; C. 60 (Nabawa x Bunyip) 31 ; C. 61 (Federation x Bunyip) 33 ; C. 84 (D.A.C. 4179 x Nabawa) 41 ; C. 85 (D.A.C. 4179 x Nabawa) 41 ; C. 70 (Federation x Bunyip) 47.

DEGREE OF INFECTION (51–100 and over)—
C. 52 (Nabawa x Gluyas Early) 51 ; C. 48 (Fortune x Gluyas Early) 62 ; C. 66 (Hd. Federation x Gluyas Early) 62 ; C. 49 (Fortune x Gluyas Early) 65 ; C. 69 (Warren x Bayah) 66 ; C. 76 (Minister x Toby's Tusk) 68 ; C. 83 (D.A.C. 4179 x Nabawa) 68 ; C. 62 (Nabawa x Gluyas Early) 74 ; C. 57 (Currawa x Gluyas Early) 76 ; C. 67 (Toby's Tusk x Nabawa) 81 ; C. 68 (Currawa x Gluyas Early) 81 ; C. 56 (Currawa x Cowra 15) 85 ; C. 51 (Toby's Tusk x Gluyas Early) 88 ; C. 64 (Indian 7 x Currawa) 90 ; C. 47 (Minister x Toby's Tusk) 91 ; C. 53 (Gluyas Early x Bunyip) 94 ; C. 75 (Correll's No. 9 x Minister x Quantity) 95 ; C. 54 (Correll's 9 x Minister) 97 ; C. 78 (Clubhead x Vindessa) 97 ; C. 50 (Toby's Tusk x Gluyas Early) 106.

BUNT RESISTANCE—LINE RESISTANCE.

To observe the variation in resistance between the different strains or "lines" of a variety, an experiment was planted similar to the Flag Smut resistance test.

Two varieties "Nabawa" and "Carrabin" were used. Fifty seeds were planted per row, the seeds being taken from the same twenty-five plants ("lines") used for the Flag Smut test. Seed infection was carried out in the same manner as for the varietal resistance test, *i.e.*, the spores of five Bunt balls were used for each packet of 50 seeds. The results obtained are hereunder—

BUNT RESISTANCE TEST, 1927.

LINE RESISTANCE.

Line	Carrabin.				Nabawa.			
	Clean Plants.	Infected Plants.	Total.	Percentage of Infection.	Clean Plants.	Infected Plants.	Total	Percentage of Infection.
				%				%
1 ...	24	12	36	33	24	8	32	25
2 ...	21	8	29	27	21	10	31	32
3 ...	28	6	34	18	22	13	35	37
4 ...	25	10	35	29	26	12	38	32
5 ...	21	17	38	45	20	21	11	51
6 ...	30	9	39	23	22	16	38	42
7 ..	23	6	29	21	26	14	40	35
8 ...	21	4	25	16	25	16	41	39
9 ...	26	4	30	13	27	13	40	32
10 ...	23	14	37	38	24	12	36	33
11 ...	24	11	35	31	17	10	27	37
12 ...	25	9	34	26	19	20	39	51
13 ..	25	7	32	22	21	13	34	38
14 ...	24	8	32	25	25	17	42	45
15 ...	26	4	30	13	25	9	34	27
16 ...	30	7	37	19	24	19	43	44
17 ...	28	11	39	28	22	17	39	43
18 ...	35	6	41	15	22	18	40	45
19 ...	23	10	33	30	19	21	40	52
20 ...	23	7	30	23	24	15	39	38
21 ...	29	8	37	22	13	23	36	64
22 ...	15	8	23	35	17	18	35	51
23 ...	31	7	38	18	26	18	44	41
24 ...	24	4	28	14	15	22	37	59
25 ...	24	7	31	23	19	19	38	50
	Totals and Average	205	832	25	Totals and Average	394	939	42

It will be noticed that there is a wide difference between the Bunt resistance of the different lines of the same variety, and ranges from 13 to 45, average 25, in the case of "Carrabin," and from 25 to 64, average 42 in the case of "Nabawa." This indicates the possibility of improving the Bunt resistance of existing varieties by selection.

INFECTION WITH BOTH FLAG SMUT AND BUNT.

A trial was conducted in which the seed was infected with both Flag Smut and Bunt. The results showed—

(1) That it was quite possible to have both diseases in the same plant, and

(2) That this method was unsatisfactory as a means of testing the relative resistance of the varieties to either disease.

For instance, when infected with both diseases the percentage of plants found with Flag Smut was 14; when infected with Flag Smut only the percentage of diseased plants was 44; with Bunt the combined infection produced 60 per cent. diseased plants, and the infection with Bunt only 88 per cent.

"WATSONIA."

(*Antholyza aethiopica.*)

W. M. Carne and C. A. Gardner.

The plant described here is one of several known in this State as "Watsonia."

The name is used to include true Watsonias as well as ***Antholyza.*** They are South African plants and, like many other herbaceous perennials from that country, thrive in this State. Indeed South African bulbs, using the word in a general sense to include plants with corms or swollen rhizomes, are always liable to become weeds with us. Cape Tulip, Guildford Grass, Arum Lily, Freesia, Babiana, Ferraria, and others besides the Watsonias have already become naturalised weeds. In most cases they have spread from gardens in which they have been grown for their flowers.

Watsonia is well established from Bullsbrook south through the coastal areas. It particularly favours creeks and river flats, but is not at all particular. The better the soil and the better watered it is, the more the plant thrives. Where it has not yet become established care should be taken to keep it out or it may eventually occupy much good land and take possession of creeks through the south-west. The bulbs (really corms) are very tenacious of life and pulling up and stacking in heaps is not sufficient to kill them. They should be burnt. Constant cutting or hoeing the plants will eventually kill them but this method cannot be expected to be successful in one season.

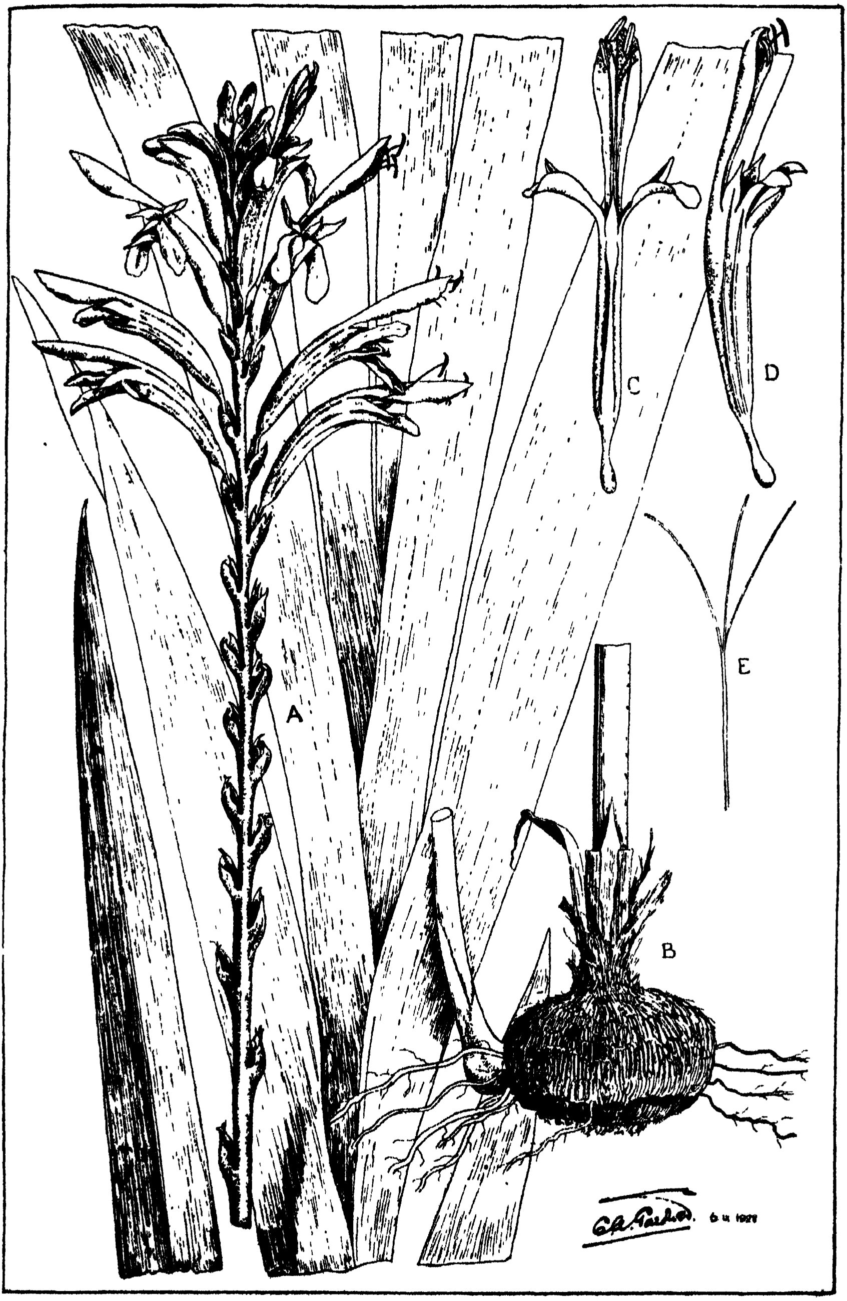
Description of Plant.

A tall herbaceous plant attaining a height upwards of six feet. Corm usually depressed-globular, tunicated with latticed coats. Leaves distinctly two-ranked, the leafy part of the stem almost fan-like, leaves long, soft and bright green.

Flowers in terminal spikes, simple or rarely branched, the spikes 2-ranked, the spathe-valves small oblong and purplish. Flowers reddish, the tube yellow to orange-red, the limb scarlet, 2-3 inches long, curved, the segments unequal, the uppermost the longest. Fruit an almost globular capsule, beaked, with 2-4 orange-coloured seeds in each cell.

Explanation of Plate.

A. Habit. B. Corm. C. Front view of flower. D. Side view of same. E. Summit of style. A. and B. half natural size, C. and D. slightly less than natural size, E. much enlarged.

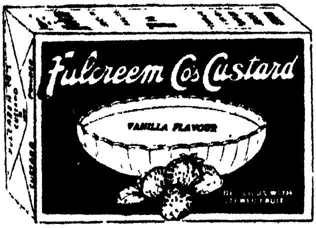


"Watsonia."

(*Antholyza aethiopica.*)

Meals made more tasty with

FULCREEM BRAND DESSERTS.



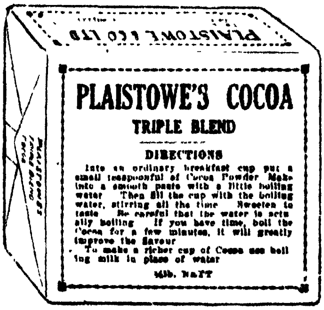
1lb., 4oz., and 2oz. Packets. Make Delicious Custards. Serve them with Don Jellies or with Pies, Fruits, or Preserves.

Each Packet makes 20 dainty little Cakes and contains 20 Paper Cups to bake them in.

Don
JELLY CRYSTALS
Manufactured by FULCREEM CO PERTH WA

All Flavours. Clear and Set Well. Serve them with Custard, Blanc-mange, Fruits, or alone.

All Flavours. Serve them with Jams, Fruits, or Don Jellies.



DIRECTIONS

Into an ordinary breakfast cup put a small teaspoonful of Cocoa Powder. Make into a smooth paste with a little boiling water. Then fill the cup with the boiling water, stirring all the time. Sweeten to taste. Be careful that the water is actually boiling. If you have time, boil the Cocoa for a few minutes, it will greatly improve the flavour. To make a richer cup of Cocoa use boiling milk in place of water.

½lb. NETT

1lb., ½lb., and ¼lb. Packets. An absolutely Pure Cocoa of the finest quality sold at 1s. 4d. per lb.

EVERY GROCERY STORE IN W.A. SELLS THEM.

ASK FOR

PLAISTOWE'S

CHOCOLATES AND SWEETS.

WHOLE WHEAT MEAL.

By Margaret A. Wylie.
Inspectress and Organiser, Domestic Science Classes,
Education Department.

Wheat, oats and maize belong to a class of foods known as cereals. They are the seeds of well known grasses which vary in food-producing properties, according to the effect of climate and variety of soil in which they are grown. Generally speaking, however, each contain nutritive ingredients—proteins, carbohydrates and mineral matter, with a small amount of water. Wheat contains more protein (flesh forming material) and carbohydrates (heat and energy producing) than oats and maize. Their respective constituents are shown in the following table:—

——	Water.	Protein (Gluten, etc.).	Fat.	Carbohydrate (Starch, sugar).	Cellulose (Bran, etc.).	Mineral Salts.
	%	%	%	%	%	%
Wheat ...	12·0	11·0	1·7	71·2	2·2	1·9
Oats	10·0	10·9	4·5	59·1	12·0	3·5
Maize	12·5	9·7	5·4	68·9	2·0	1·5

The grinding of cereals gives meals. A further table shows a comparison of their respective food values:—

——	Water.	Protein.	Fat.	Carbohydrates	Cellulose.	Mineral Salts.
	%	%	%	%	%	%
Whole Meal ...	12·1	12·9	1·9	70·3	1·6	1·2
Fine (Wheat) Flour ...	13·0	9·5	0·8	75·3	0·7	0·7
Oatmeal ...	7·2	14·2	7·3	65·9	3·5	1·9
Rolled Oats ...	7·2	15·4	7·2	64·8	3·5	1·9
Maize Meal ...	11·4	8·5	4·6	72·8	1·4	1·3

It will be seen that the proportion of carbohydrate in each of the meals is larger than that of protein. Also that the amount of protein in whole meal is greater than that of fine flour.

Considering the important part that flour plays in the list of food materials a brief description of the grain from which it is derived may be interesting. If a grain of wheat is examined under a microscope it will be found to consist of the following parts:—

1. The germ or embryo—rich in protein and fat.
2. The kernel or endosperm—consisting of masses of nutritive material found in delicate "honeycombed" cells, particles of gluten filling up the spaces.
3. The bran—the outer envelope—composed chiefly of cellulose, mixed with mineral matter.

Compare the food composition of its different parts:—

——	Bran.	Kernel.	Germ.	Whole Grain.
	%	%	%	%
Water	12·5	13·0	12·5	14·5
Protein	16·4	10·5	35·7	11·0
Fat	3·5	0·8	13·1	1·2
Starch	43·6	74·3	31·2	69·0
Cellulose	18·0	0·7	1·8	2·6
Mineral Salts	6·0	0·7	5·7	1·7

Principally because of the difficulty of grinding the whole of the grain to a fine powder, during the process of milling, the outer coating of bran and also the germ is removed, hence the fine white flour of commerce has lost a great deal of its food value. In the days of stone grinding of wheat the bran was fanned away but the germ was left. This flour however did not keep as well as the present day white flour on account of the large proportion of fat contained in the germs. Present day milling then, produces a flour which, although lacking in protein, cellulose and mineral salts, is rich in carbohydrates and possesses also properties which recommend it for commerce. The fact that nourishing materials have been removed from white flour makes it appear that white bread is inferior to brown or whole bread. But it is not always the food that contains the highest percentage of nourishing material which is the most valuable, but the one that contains these constituents in a form capable of being absorbed. Coarse flours contain more protein and fat but owing to the amount of crude fibre or cellulose they are not as easily assimilated, and according to Doctors Hutchinson on Food (London), Snydes of Minnesota and Wood and Merrill of Maine, U.S.A., they really furnish less nourishment than is obtained from fine grades of flour. Other authorities, however, contend that whole wheaten flour has greater advantages over the flour that has been deprived of its mineral salts and cellulose. The following points in this respect are worthy of consideration:—

1. Whole wheaten flour bread has a greater sustaining power than bread made from white flour. It remains longer in the stomach.
2. It requires more mastication and therefore draws out the value of the saliva as a digestive fluid.
3. Its mineral properties act as a laxative—giving natural salts in proper proportions. In the case of people with sluggish intestines whole meal bread is preferable to white as it helps to maintain regular peristaltic action of the bowels and rightly takes the place of aperient medicines.
4. It supplies fat to those who cannot digest it in other forms.
5. It gives lime salts in districts where water and vegetables are deficient in lime—thus forming a suitable food for children and helping to prevent early decay of teeth.
6. Where meat and vegetables are lacking wheaten meal bread not only supplies the necessary bulk but gives the flesh-former as well as the requirements in the way of heat and energy to the body.

7. It is rich in Vitamins—those subtle elements which do so much to preserve health and encourage the growth of the body.

To obtain the best results from wheat it is advisable to grind a fresh amount every few days. This is of course only workable when small quantities are required—when a small coffee grinder can be utilised.

Whole wheat meal can be used instead of oatmeal for porridge. For thickening soups, stews, gravies and sauces it can be used instead of fine flour.

The following recipes for using whole wheat meal and also recipes for the use of bran might be appreciated by the housewife:—

Wheaten Loaf (without yeast).

1 cup of wheaten meal.
1 small teaspoon cream tartar.
½ teaspoon bi-carbonate of soda.
1 cup S. R. flour.
3 teaspoons treacle.
Milk.

Method:

1. Mix dry ingredients.
2. Dissolve treacle in little milk and add to mixture with sufficient milk to make a soft dough.
3. Pour into 2 greased tins (tall tins with lid).
4. Bake in hot oven ½ hour.

Whole Meal Bread (yeast).

1½ lbs. whole meal or ½ whole meal and ½ plain flour.
1 tablespoon brewer's yeast (1½ home made).
1 teaspoon salt.
¾ pint tepid water.
2 teaspoons sugar.

Method:

1. Sift and warm flour.
2. Mix yeast and sugar.
3. Add to flour and mix with tepid water and beat well.
4. Mark dough with a cross to allow the escape of CO_2. Leave in warm place until dough is twice the size.
5. Turn on to a floured board, add salt and knead until smooth and even.
6. Divide into loaves. Put in greased tins.
7. Put in a warm place. Allow to rise about 45 minutes, the surface should show small cracks or air bubbles.
8. Bake in a hot oven about an hour.

Wheat Meal Biscuits.

½ lb. flour.
½ lb. wheat meal.
6 ozs. butter.
2 eggs.
¼ lb. sugar.

½ teaspoon bi-carbonate soda.
1 teaspoon cream of tartar.
Little milk.

Method:

1. Put meal and sifted flour, cream of tartar and soda into basin.
2. Add butter and rub in with finger tips.
3. Add sugar then beaten egg and milk.
4. Turn on floured board, roll out thinly.
5. Stamp into rounds and bake a pale brown in a moderate oven.

Note.—Oatmeal may be used instead of wheat meal.

Bran Scones.

1 cup of flour.
2 cups of bran.
1 cup of milk.
1 egg.
1 teaspoon bi-carbonate soda.
¼ cup treacle.
1 or 2 tablespoons brown sugar.
1 or 2 ozs. butter.

Method:

1. Beat egg and sugar together.
2. Add treacle, melted butter and soda dissolved in milk.
3. Add flour and bran. Mix well.
4. Turn on to a floured board and roll out. Stamp in rounds.
5. Bake in moderately hot oven about ½ hour.

Bran Muffins.

1 cup wheat bran.
1 cup wheat meal.
1¼ cups milk.
(½ cup stoned raisins).
1 egg.
1 tablespoon sugar.
1 teaspoon salt.
1½ teaspoons baking powder.
2 tablespoons melted butter.

Method:

1. Mix dry ingredients (and raisins if used).
2. Add well beaten egg and melted butter and enough milk to mix to a stiff batter.
3. Bake in hot oven—in small patty pans or gem irons.
4. Note—1 or 2 tablespoons honey may be used instead of sugar.

Bran Biscuits

1¼ cups S. R. flour.
2 cups bran.
¼ cup butter.
½ cup sugar.
1 egg.
Milk.

Method:

1. Cream, butter and sugar.
2. Add eggs and beat well.
3. Add flour and bran and mix in a little milk.
4. Turn on to board and knead.
5. Roll out and cut into rounds.
6. Put on a greased slide and bake in a moderate oven till light brown.

MARKET REPORT.

The following particulars of the approximate quantity of chaff available for auction at the metropolitan chaff and grain sales held in Perth during the months of June, July and August, also the minimum and maximum prices ruling for f.a.q. to prime wheaten, have been supplied by Messrs. H. J. Wigmore & Co., Ltd., of Wellington Street, Perth:—

June—Quantity, 1.100 tons.
Maximum price, £6.
Minimum price, £5 10s.
July—Quantity, 1,300 tons.
Maximum price, £7.
Minimum price, £6 5s.
August—Quantity, 1,150 tons.
Maximum price, £6 12s. 6d.
Minimum price, £6 5s.

Owing to the extremely dry weather experienced in June and the late season natural feed was very backward, and in some districts almost non-existing, consequently practically throughout the farming areas all stock had to be hand-fed, resulting in an enormous consumption of hay and chaff. Under normal conditions quite a number of farmers would have had a surplus available for sale, but the same farmers were forced to purchase fodder to carry out their fallowing operations, etc. This placed the hay market in an entirely different position to that ruling when the last issue of this Journal went to press. It will be noticed that in July the maximum price was £7. This high price, to a large extent, was caused through stormy weather which prevented chaff-cutting, and immediately better weather prevailed the market eased somewhat. At time of going to press £6 10s. is being secured for f.a.q. to prime, but new season's hay will soon be available, and farmers having a surplus will be well advised to consign to auction.

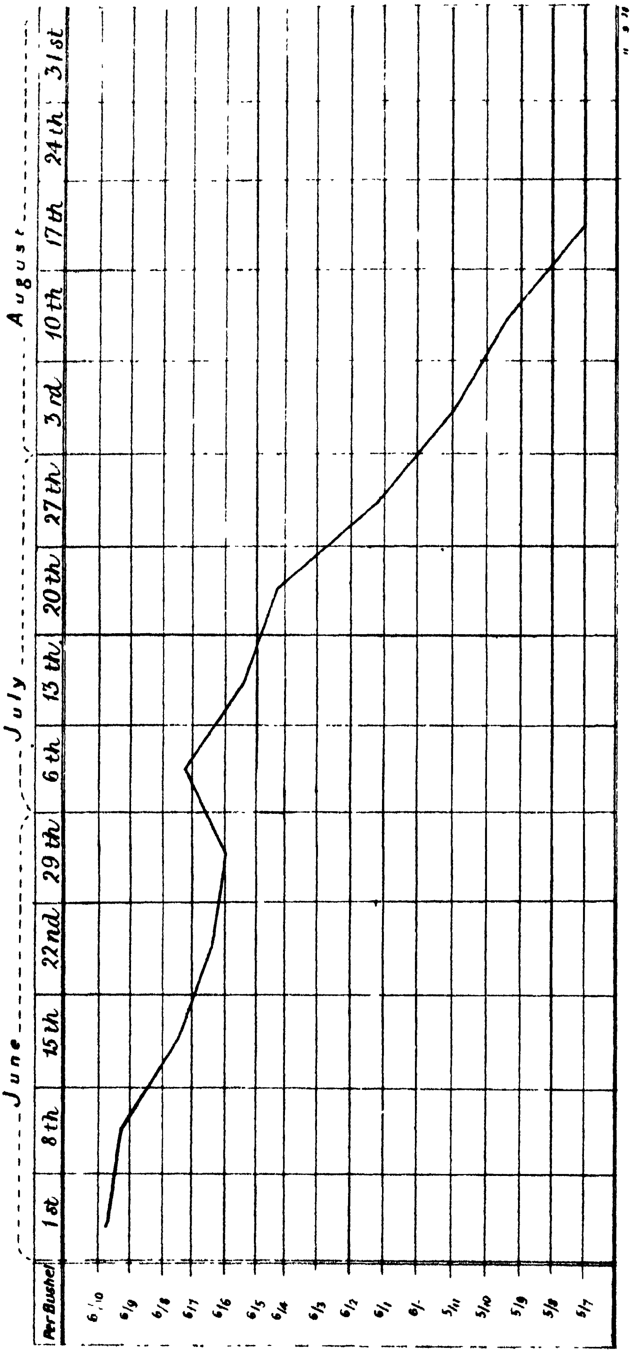
Oaten Chaff.—Right throughout the period under review oaten has been in demand at prices equal, if not better, than those ruling for wheaten.

Oats.—When writing our last report the market stood at 4s. 6d. per bushel for good heavy feeds, since then it has eased slightly, but during the last few days very few supplies have been finding their way to market, and up to 4s. 9d. has been secured for consignments of exceptional quality. there being a steady demand for good heavy feeds at around 4s. 6d.

Wheat.—In sympathy with the overseas market local prices have depreciated considerably, f.a.q. selling during the last few days at auction at around 4s. 10d. per bushel. other qualities at lower prices according to sample.

Return of Wheat Prices Per Bushel

C.I.F. & E. London



Compiled from figures kindly supplied by the Co Operative Wheat Pool of W A

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK YARDED AT METROPOLITAN FAT STOCK MARKETS DURING MONTHS OF JUNE, JULY, AND AUGUST, 1928.

—	June.				July				August.				
	6.	13	20.	27.	4.	11	18	25.	1.	8.	15.	22.	29
Sheep and Lambs	5,294	6,881	7,252	10,294	11,127	10,208	8,884	7,954	10,857	9,840	11,562	10,549	8,303
Cattle ...	756	955	773	644	629	905	703	469	746	932	743	756	573
Pigs ...	037	665	756	678	617	760	530	628	772	538	365	471	720

COMPARATIVE VALUES PER LB. OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS DURING MONTHS OF JUNE, JULY, AND AUGUST, 1928.

—	June.				July.				August.				
	6.	13.	20	27	4.	11.	18.	25.	1.	8.	15.	22.	29
Mutton	13½	13¼	13½	11	11	10½	10½	11	11	11½	11	11	10
Beef ...	8½	8½	8½	8½	8½	8½	8½	9½	9	10½	8	7¾	7
Pork ...	12½	12½	12½	12¼	12½	12	12¼	12¼	12¼	12¼	12¾	13	13
Bacon	9¼	9¾	9¼	9¾	9¾	9½	9½	9¾	9¾	10	10	10	10

METEOROLOGICAL INFORMATION.

STATIONS.	TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.	
	Maximum.		Minimum.				Maximum.		Minimum.				Maximum.		Minimum			
	Mean.	Highest.	Mean.	Lowest.	For Month.	Average.	Mean.	Highest	Mean.	Lowest.	For Month.	Average.	Mean.	Highest.	Mean.	Lowest.	For Month.	Average.
	JUNE 1928						JULY, 1928						AUGUST 1928.					
					inches.	inches.					inches.	inches.					inches.	inches.
Chapman State Farm ...	67·8	75·3	48·2	39·9	2·62	4·14	66·2	75·7	45·6	37·5	6·03	3·97	67·6	75·5	45·9	40·1	2·43	2·72
Geraldton	70·5	78·6	53·1	44·6	4·63	4·68	67·6	74·6	52·3	29·0	4·32	3·91	69·1	75·4	53·5	45·0	1·72	2·93
Wabebing	64·7	72·8	44·9	39·0	2·32	3·94	61·4	71·2	42·8	35·0	5·06	3·69	64·0	73·0	42·3	34·0	2·71	3·04
Perth	66·3	75·0	50·7	45·5	5·50	6·94	63·0	70·9	48·2	39·7	11·89	6·56	64·2	69·2	50·5	41·0	12·21	5·65
Kalamunda	64·1	71·3	49·9	41·0	6·01	8·05	63·5	68·3	46·7	39·2	13·07	8·05	63·6	67·8	48·3	40·9	11·67	6·74
Bunbury	64·4	69·0	48·5	42·0	4·88	7·17	61·6	68·4	47·6	37·0	6·80	6·99	63·4	67·8	51·1	38·2	5·75	5·39
Bridgetown	63·5	70·5	39·0	28·5	3·36	5·83	60·0	68·0	41·1	33·0	7·39	5·79	62·3	69·8	43·1	33·0	7·55	5·09
Albany	62·6	71·4	47·1	39·0	6·36	5·48	60·3	69·6	47·2	42·0	7·12	5·51	62·3	70·4	47·2	38·6	5·74	5·20
Merredin State Farm	62·8	71·9	45·0	37·0	1·07	1·83	59·5	71·6	41·8	29·6	2·24	1·92	64·2	71·3	42·0	32·6	1·54	1·39
Northam	65·8	73·0	44·4	35·2	1·46	3·29	62·8	72·0	41·9	32·8	6·73	3·38	64·9	72·0	43·8	35·0	2·60	2·57
York	65·3	72·8	43·2	32·2	1·31	3·36	62·0	73·0	41·1	31·0	7·30	3·34	64·5	72·0	44·2	35·0	2·93	2·82
Narrogin State Farm	61·1	69·3	42·8	35·7	1·78	3·70	58·2	65·7	41·0	30·0	6·93	4·09	60·5	69·7	43·1	32·7	4·43	3·17
Katanning	61·1	68·2	42·2	32·3	2·22	2·88	57·8	66·0	42·1	35·0	4·03	3·54	60·8	65·0	44·5	34·0	3·24	2·49
Cape Leeuwin ...	63·9	69·8	54·2	47·5	4·92	6·88	61·0	72·2	52·9	45·0	10·19	7·13	61·5	66·0	52·7	43·8	6·99	5·23

PRODUCERS' MARKET REPORT.

The Producers' Markets Ltd. report as under for the quarter ended 31st August, 1928.

FRUIT.

Supplies of fruit were short early in the period, values on the whole being very firm. Apples, owing to the short crop, were in keen demand, many inquiries being received for varieties suitable for long storage. Very little selling between grower and buyer was noticed, as growers were content to cool store on their own behalf and market accordingly. This has had a great influence on the market throughout the period. Efforts have been made by those controlling the cool stores to keep a regulated supply and this has proved successful to date. With the drawing of apples from cool stores in July, supplies increased but values remained high holding up to expectations and this continued throughout the three months.

Navel oranges of prime quality commenced firm although weather conditions were against this fruit and, with the supplies increasing, values for falls and thick skinned varieties became easier although prime fruit sold at steady rates. To date values show a big improvement on the previous season's crop, mainly owing to the fruit being of a better quality less percentage of falls in comparison with the previous season, when falls were numerous.

Local tomatoes were about finished at the end of July, their place being taken by the first of the Geraldton crop. This crop was slow in coming forward and values commenced high as against the previous season when values were low at the commencement. At the end of August, supplies were plentiful, values being steady.

Passion fruit have been short throughout the period and high values obtained for any quality fruit.

Lemons, as is only to be expected at this period of the year, have been low in values but with the improvement in weather conditions values should firm.

The mandarin crop was good, values for prime lines firm, but supplies on the whole have consisted of small fruit. Towards the end of August a few cases of loquats were noticed, this fruit being mostly small and dry.

On the whole, values for the period have been firm and should compensate the grower to some extent for the short crop.

VEGETABLES.

Supplies of vegetables were moderate early in the period and values were easy. In June we were still offering lines of last season's produce, namely—potatoes, swedes and beans. Later in the month new seasons peas and beans were submitted from the Geraldton district and values firmed considerably. Supplies have been regular all the time and prices reached as high as 1/7½ per lb. Towards the end of the quarter the volume increased and values receded to 7¼d. for prime samples. Potatoes have been moderately supplied and the demand good for prime samples of matured potatoes. Second grades were selling well early in the period but have little value just now, owing, no doubt, to the low price ruling for the imported article. New-dug metropolitan potatoes have been on the market during most of the quarter and early lots were from small sheltered plots and realised high prices. These have since eased in quantity and values are holding well. New-dug lines have been coming forward during the latter part of the period from the Balingup district. These are prime samples and values have been firm, especially for those lines from growers who grade and wash them.

Cabbages were heavily supplied during June and July and values were steady. First grade lines were in demand, and some prime lines were offered from the Spearwood district. Some very prime lines were forward from the country, among which was a splendid crop from Lennox. A big proportion of the cabbage sent to auction from the country is much too large and not tightly packed in the bags. Consequently values suffer and the grower is dissatisfied.

Pumpkin supplies were heavy during the early part of the period and values were steady. A lot of inferior quality were being marketed. These were hard to quit and had the tendency to lower the price of the prime lines. Supplies have been shorter during the last month and values have firmed. Prime *Triumble* of good size and colour is in demand also Prime *Queensland Crinkliss.*

Cauliflowers were only moderately supplied during the first two months and the quality was poor. First grade lines were firm on account of this. Other grades easy. The supply was heavier earlier in August but fell away sharply toward the end of the month, owing no doubt to excessive water in the gardens. Country lines were a failure early in the quarter but some prime lines are being submitted now and values for these are good.

Swedes were heavily supplied during June and values were low. These soon cut out though, and supplies have been scarce and the demand very keen for any lines approaching prime quality. Growers are also advised to pay particular attention to the preparing of swedes for market and to grade carefully.

Rhubarb supplies have been plentiful all the quarter and values have been steady, the demand being good, owing to a short supply of apples for cooking. Bunch roots were heavily supplied during the quarter and the demand keen for prime lines. Carrots and parsnips were firm all through. Beetroot and turnips were dear in the earlier part of the period but during August these two lines eased considerably. Lettuce has been short supplied during the whole of the quarter and values have been firm. The demand is still good for prime lines.

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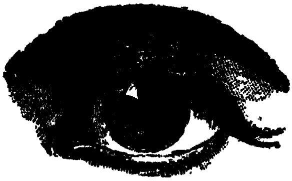

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BITTER PIT IN APPLES.

SOME RECENT INVESTIGATIONS.*

W. M. CARNE, F.L.S.,
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Bitter Pit probably dates back at least as early as the initiation of commercial apple-growing. According to McAlpine the earliest recognisable record of the disease was made in Germany in 1869 and in Australia in 1886. The first name given to it was Stippen, which was used in Germany in 1892, but the later name Bitter Pit given to it by Cobb in New South Wales in 1895 is more commonly used in English-speaking countries.

Bitter Pit came into prominence in Australia following the early development of an overseas trade in apples, somewhere about 1900. This trade led to a large increase in the area under apple trees. The presence of the disease in the orchards and especially on the young trees, together with complaints from England of its occurrence in exported fruit, made it apparent that it was not to be lightly regarded. In 1908 at a Conference held in Melbourne of the National Fruitgrowers' Association, a motion was passed asking the Commonwealth Government to undertake an investigation into the cause and control of Bitter Pit. Little assistance in the way of investigations could be looked for from abroad, as in no other country did the trouble appear to cause such severe losses as in Australia. The problem seemed to be essentially an Australian one. This has been confirmed by agents' reports, and more definitely by Dr. Barker who made a detailed inspection of the 1927 shipments in England on behalf of the Empire Marketing Board. It is evident that not only is Bitter Pit more marked in Australian apples than those from elsewhere, but also that it is the principal defect of our apples in European markets. In 1911 the Commonwealth Government appointed

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* This article was published in the "Journal of the Council for Scientific and Industrial Research," Melbourne, November, 1928.

D. McAlpine, the then Plant Pathologist of Victoria, to carry out investigations for a period of four years. He completed his work in 1916 having in the meanwhile produced five large volumes which form the principal published work on the subject to date. He developed a theory as to the origin of the disease, but like other theories, both earlier and later, it offered nothing which appeared to open a way to place the control of the disease in the hands of growers. Of the principal results of McAlpine's work perhaps the most important was the demonstration that heavy pruning of susceptible varieties increased the liability of the fruit to Bitter Pit, at least in the orchard. This knowledge has become general amongst growers, and varieties like Cleopatra are given a minimum of pruning.

Up till the present time therefore, although a large amount of miscellaneous information has been accumulated in regard to the disease, it has continued unbated both in the orchards and in exported shipments. It has, indeed, come to be regarded by growers as more or less inevitable though varying in its effects from season to season.

In 1926 Dr. A. J. M. Smith, an English Scientist attached to the Low Temperature Research Station at Cambridge, carried out some investigations in Tasmania into the problem. He came to the conclusion that some varieties are specially liable to develop Pit while on the trees and that others tend to develop it more after picking. Further, of the latter varieties, the fruit picked early was more liable than the fruit picked later. Dr. Smith carried out his tests with Ribston and Cox's Orange Pippins.

In 1927 Wickens and Carne had experiments carried out at Bridgetown in Western Australia with Cleopatra apples. From the results of these experiments, taken in conjunction with those of Smith and others in Australia and America, they came to the conclusions that—

(a) Bitter Pit is developed in store as well as on the trees; and

(b) The earlier susceptible varieties are picked the greater their liability to Bitter Pit in store.

Carne then put forward a theory that Bitter Pit is due to the actual picking of the fruit in an immature condition. He considered that it is caused by a loss of water from the fruit as a whole which was finally borne by the more immature cells, resulting in their drying-out and death. This effect on the immature cells results from the irregular manner in which apples ripen, the more mature or sugar-filled cells being in close association with less mature starch-filled cells. As the result of osmotic action the sugar-filled cells draw water from the starch-filled cells. If the loss from the latter is sufficiently great, they are killed.

It was decided to continue the investigations during the 1928 season, and in preparation a study was made of the whole situation with a view of defining the problem to be first attacked. It appeared that the following were fundamental, and it was decided to concentrate on these problems:—

1. Confirmation of the findings of Wickens and Carne that Pit may develop in store as well as in fruit on the trees, and that in store its incidence is related to the maturity of the fruit when picked.

2. Assuming Pit to develop in fruit both on the tree and in store, is the disease in stored fruit identical with that developed in the fruit on the trees? If not, which of the two is Bitter Pit?

3. If Pit developed in stored fruit of susceptible varieties as the result of their method of ripening, is there any difference in the method of ripening of susceptible and non-susceptible varieties?

4. If Pit developed in stored fruit of susceptible varieties to a degree determined by their immaturity when picked, what constitutes a safe maturity for picking and how may it be recognised?

The investigations were carried out by the writer, his assistant Mr. H. G. Elliott, and Mr. H. A. Pitman, B.Sc.Agr., an officer of the Council for Scientific and Industrial Research, whose services were made available for the purpose.

The following is a brief statement of the methods adopted and the results obtained. Full details will be found in a bulletin to be published by the Council for Scientific and Industrial Research.

Problem 1.

That Bitter Pit is developed in storage, and that the earlier susceptible varieties are picked the greater their liability to Bitter Pit.

To test this, picking tests were carried out with the variety Cleopatra at Karagullen, Western Australia. Six pickings from trees with normal crops were made at weekly intervals commencing on the 6th February, six cases being picked each time. The fruit of each picking was graded and then placed part in cold store and part in ordinary store. That in cold store was kept for 10 weeks and then removed to ordinary storage for two weeks, thus allowing sufficient time to cover the longest period fruit is likely to be held from the time it leaves Australia until it reaches the retail buyer. That in ordinary storage was kept six weeks, at the end of which the earlier pickings were no longer commercially saleable. At the end of these periods the fruit was cut up and examined for Bitter Pit. The results of this test, taken in conjunction with those in Tasmania by Smith, in America by Brooks and Fisher using the varieties Jonathan, Grimes, and Gano, and by Overholzer and Fidler using Gravenstein, in Victoria by Adam using Annie Elizabeth, and by Wickens and Carne in Western Australia with Cleopatra, led to the following definite conclusions:—

1. That Bitter Pit is developed in stored fruit.
2. That larger fruits are more susceptible than smaller.
3. The liability to Pit decreases as the fruit becomes more mature at the time of picking.
4. That the quality of the fruit, after storage, becomes better in colour and flavour as its liability to Bitter Pit decreases.
5. That delaying picking too long increases the liability in storage to over-ripeness, especially in large fruit.

Problem 2.

The identity of the disease developed in fruit on the tree and that developed after storage.

It has been the practice in Australia to consider all the non-parasitic spot disorders of apples as 'Bitter Pit," although Jonathan Spot has been more or less recognised as a distinct disease.

A study of the literature and of the specimens which became available during the season showed that "Bitter Pit" in the sense used in Australia included disorders not recognised as Bitter Pit in other countries. An intensive study of the external symptoms and of the internal lesions, both macroscopically and microscopically, combined with the study of the symptoms described for Spot diseases elsewhere, led to the conclusion that three distinct diseases differing in origin and usually readily separable by the naked eye had been confused in the past.

It became evident that the bulk of the so-called "Bitter Pit" developed in fruit while on the trees was in reality a form of a disease called Cork in America. The Bitter Pit developed in store was, however, identical with the Stippen of Europe and with the disease originally named Bitter Pit by Cobb. It was obvious that these diseases must be investigated separately. It was also found desirable to subdivide Bitter Pit and Cork into the principal forms in which they are found.

The classification adopted is as under:—

1. *Bitter Pit or Stippen.*—Developed in stored fruit and rarely, if at all, in fruit on the trees. Two forms occur—

    (a) Mild Pit, developed in either ordinary or cold storage.

    (b) Severe Pit, developed only in cold storage.

2. *Cork.*—Developed only in fruit while on the trees. Four types are recognised—

    (a) Blotchy Cork. This is the most common and most serious form found in Australia. This type has also been found in New Zealand, but apparently not in America.

    (b) Crinkle Cork, previously known as Crinkle, Confluent Bitter Pit or Pigface.

    (c) Internal Cork, the original type of Cork recorded in America. The so-called Bitter Pit of pears in Australia belongs to this type.

    (d) Drought Spot Cork, described in America as Superficial Drought Spot. This includes much of what is known as sunburn.

3. *Jonathan Spot.*—Developed mainly after picking. More or less confused with Bitter Pit and Cork by previous writers.

The following descriptions give the more obvious distinctions between the three principal types of these diseases found in Australia:—

Bitter Pit (Figs. 1 and 2)—

Externally affected fruits show small spots mainly towards the calyx end. These may vary from grey or yellow to dark brown or almost black—from simply a discoloured spot to a definitely marked more or less circular pit rarely exceeding one-eighth inch in diameter.

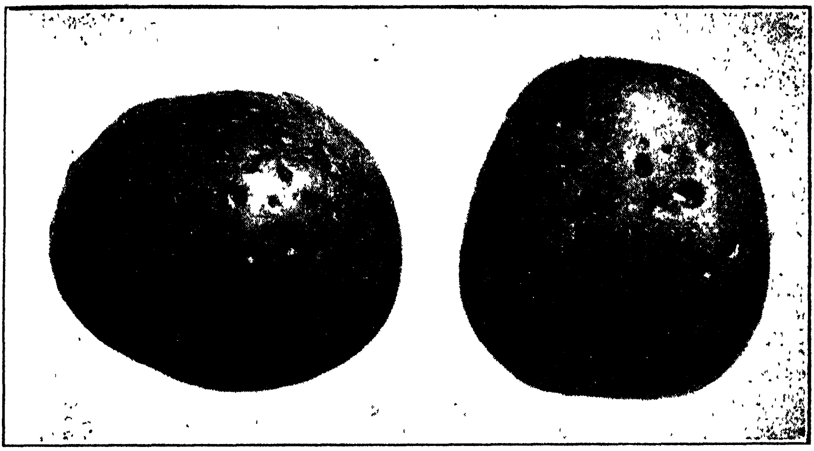

Fig. 1.—Severe Bitter Pit on Dunn's and Cleopatra from cold store.

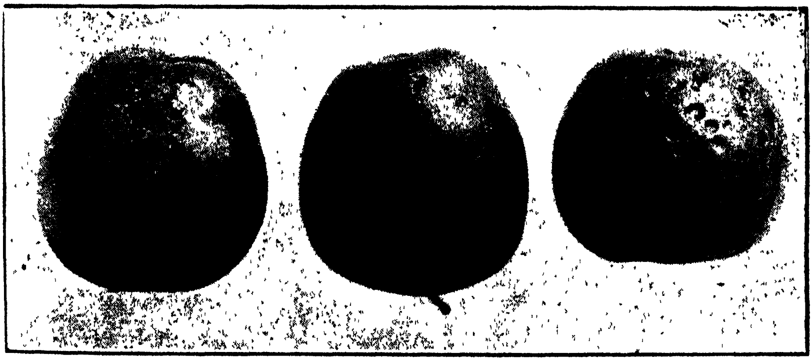

Fig 2.—Blotchy Cork, Mild Pit and Severe Pit on Cleopatra.

In Mild Pit the spots are small and relatively inconspicuous while in Severe Pit they are larger, more deeply pitted and darker in colour. In the flesh of pitted apples dead brown areas are developed, which if associated with the surface spots are not larger than them in diameter.

Blotchy Cork (Figs. 2 and 3)—

In typical cases the spots differ from those of Bitter Pit in being much larger and more irregular. The surface of the fruit is distinctly depressed, and the spots are either green or brown or green mottled with brown. The brown spots are smaller in diameter than the dead tissue in the flesh beneath. The masses of dead tissue are typically larger, and are frequently more deep-seated than in Bitter Pit. When apples are affected very slightly with Cork, it is difficult to distinguish the disease from Bitter Pit, but for all general purposes, spots associated with dead tissue in the flesh may be regarded as Cork if formed in apples while on the tree, and Bitter Pit if formed after picking.

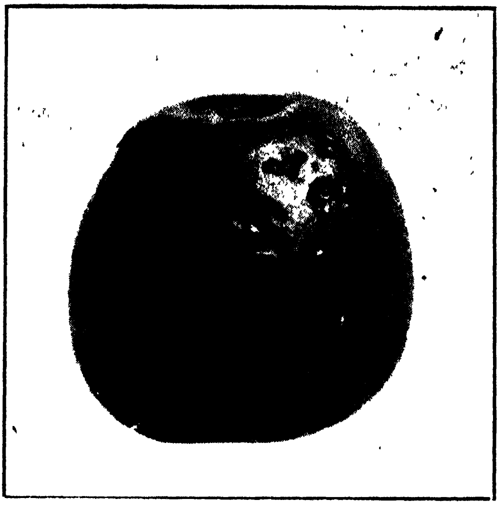

Fig. 3.—Blotchy Cork on Cleopatra.

Jonathan Spot (Fig. 4)—

This differs mainly from Pit and Cork in that it develops in the skin of the fruit and rarely penetrates deeply into the flesh. Further, each spot originates around a lenticel (as the numerous small breathing organs easily seen on an apple are called). If the apple is peeled the spots are removed with the peel and the flesh beneath in typical cases is perfectly sound.

Summing up, Blotchy Cork may be recognised by large irregular depressed areas on the surface, varying in colour, but usually consisting of a green halo surrounding dark spots. Bitter Pit has smaller more regular spots never with a green halo, and not necessarily pitted. Jonathan Spot forms spots which may be larger than Bitter Pit, but not as depressed or accompanied by a green halo as in Blotchy Cork, nor do they typically penetrate the flesh. Where secondary infection by moulds has followed Jonathan Spot, the spots become distinctly rounded with smooth edges and rotting of flesh sets in.

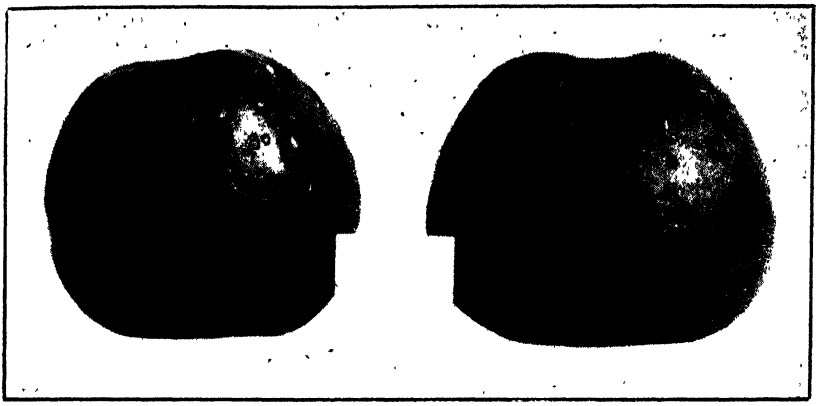

Fig 4.—Jonathan Spot on Spitzenburg. (Note secondary infection by fungi on left hand fruit.)

Problem 3.

How an apple ripens.

It was shown by Bigelow, Gore and Howard in 1905 that the process of ripening could be followed by testing apples for starch with iodine at different stages of maturity, provided the tests were made immediately after picking.

Our tests by this method have shown that in general an apple commences to ripen in and around the core and towards the stem end. The last parts to ripen are towards the calyx end near the surface and around the vessels in the flesh, or in other words, the last parts to ripen are those in which Bitter Pit is usually found.

Examination of different varieties showed that outside the core line the starch disappeared more or less irregularly. The effect of the iodine is to turn the flesh containing starch blue or purple, and the presence of starch can be taken as an indication of immaturity. If an apple is cut across its diameter and iodine applied to the cut surfaces, a blue stain will appear as follows (Figs. 5-7):—

(a) In very green apples all the flesh will be blue, or a little unstained flesh may appear around the core.

(b) In ripening but still immature apples the flesh around the core will be unstained, and the remainder will be broken up into bands, wedge-shaped masses or spots of blue tissues separated by unstained areas.

(c) In ripe apples the staining will be confined to small patches or spots near the surface, or if very ripe, no staining will appear at all.

While in general these reactions are the same for all apples, distinctions in the regularity with which the starch disappears can be recognised in different varieties. In Cleopatra, a very Pit-liable variety, the ripening or starch disappearance is very irregular, and the close association of starch-filled cells with those from which the starch has disappeared is normal. In Granny Smith, a moderately Pit-liable variety, the ripening is more regular, but the close association of cells with and without starch occurs. In Yates, a variety never known to be affected by Bitter Pit, the disappearance of starch throughout the flesh is much more regular, and appears to go on to a greater or lesser extent in all the flesh cells at the same time, so that a definite association of stained and unstained tissues does not occur.

These results support the idea that Bitter Pit is associated with the disappearance of starch, and that the susceptibility of a variety is determined by the regularity of starch disappearance from the cells of the flesh. The greater the irregularity the greater the susceptibility to Bitter Pit.

Problem 4.

How to recognise maturity of apples for picking.

No satisfactory guide to the maturity of apples for picking had been devised up till the present. Recommendations based upon the development of the ground colour, the colour of the pips, and the ease with which the fruits leave their stalks, are generally given. An instrument known as a pressure-tester was devised for the purpose in America, but neither there nor in our tests has it proved satisfactory. Indeed only one test appeared to give satisfactory results, and that was the iodine test (which has the advantage of being based upon definite chemical changes going on in the fruit).

In the picking tests with Cleopatra referred to under Problem 1, typical fruits of each grade at each picking were treated with iodine and photographed. When the final results of storage were obtained in regard to Bitter Pit, colour, and flavour, the results were compared with the pictures of the iodine reaction for the several pickings. It was found that the amount of starch shown by the iodine shortly after the apples were picked, was definitely related to the amount of Bitter Pit, colour and flavour subsequently developed by the apples in storage.

It was concluded that the iodine test renders it possible to predict the condition in which apples will emerge from cold storage. The best results were obtained from fruit which showed only small scattered patches of tissue containing starch when picked.

The experiments were confined to the variety Cleopatra, but it is highly probable that the best stage of maturity for other varieties, which are liable to Pit, will be found to be similar to that of Cleopatra.

Conclusions drawn from the investigation.

The principal results of the investigation may be summed up as follows:—

1. Bitter Pit is a disease occurring principally, if not entirely, in apples after picking. It has been recorded in many varieties, but Cox's Orange Pippin, Ribston Pippin, Cleopatra, Sturmer Pippin, Dunns, and Granny Smith appear to be the most affected of our principal export varieties.

2. Cork, especially the form Blotchy Cork, is the disease previously known as "Bitter Pit" developing on apples while on the trees. It has been found in many varieties, but in these experiments more particularly in Cleopatra, Spitzenberg, Five Crown, Sturmer Pippin, Newtown Pippin, and French Crab.

3. Jonathan Spot is a superficial spot disease, and has been noted principally on Jonathan and Spitzenberg, but also occurs on many other varieties, including Yates.

4. The problems of the control of Cork and Jonathan Spot still await solution.

5. Bitter Pit is produced in apples by picking before the fruit is sufficiently matured.

6. The correct picking date for varieties susceptible to Bitter Pit can be ascertained by treating the apples with iodine immediately after picking.

7. Picking apples later in the season for export than has been usual will not only reduce the liability of the fruit to Bitter Pit, but will ensure high quality in flavour and appearance.

The application of the findings of this investigation to commercial practice.

1. Avoid over-sized apples for export, as these are more liable to Bitter Pit and Internal Breakdown (over-ripeness) than normal sizes.

2. Apples should be picked on the basis of maturity and not on size. It is suggested that the following procedure be adopted for testing for the maturity of Cleopatra apples for export or storage. This method is probably effective for all other susceptible varieties.

Material required.—Iodine solution and a few shallow vessels. To make the solution, dissolve 1 grm. potassium iodide and 0.25 grms. iodine in 100 c.c. water.

Selection of Fruit.—Select not less than twenty typical samples of the fruit of the size grade to be picked.

Method of testing.—(a) Within one hour of picking cut the apples in half equatorially, that is, through the centre of the cheeks. Care should be taken to prevent the cut halves from getting mixed.

(b) Pour the iodine solution into a sufficient number of vessels. Place the cut surface of one-half of each apple in the solution, and leave for one-half minute. Remove and place with treated surfaces upward. Allow to stand for three to five minutes.

(c) Examine the apples, taking note of the development of a blue or purple colour in the flesh. Group the apples on the following basis.

Over-mature for picking.—No colour or practically no colour in the flesh.

Ready for Picking.—Colour in the flesh in small spots scattered through the pulp outside the core line, but none within the core line. Fig. 5 shows the correct reaction.

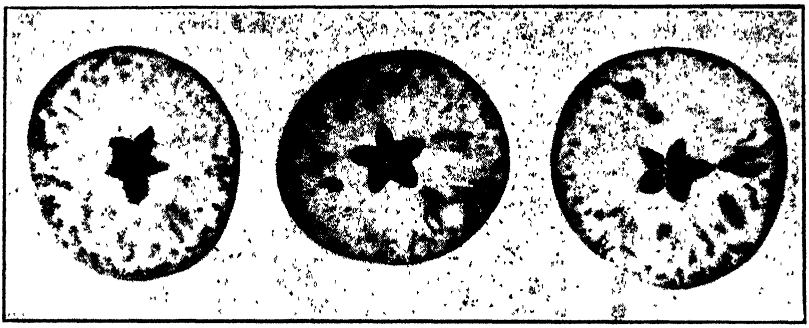

Fig. 5.—Iodine test for maturity. Cleopatra apples—correct maturity for picking for export or storage.

Too green for picking.—Colour in relatively large patches in the flesh; or flesh all coloured; or flesh coloured except within core line. Compare Fig. 6.

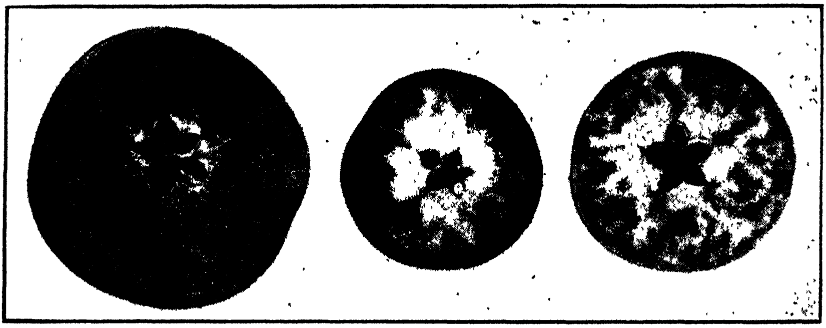

Fig. 6.—Iodine test for maturity. Cleopatra apples—too immature for picking for export or storage.

3. If less than one-half of the tested apples are ready for picking, the test should be repeated a few days later and picking delayed. When one-half of the sample apples give a satisfactory test, these should have their two halves brought together and then be distributed to the pickers and packers to act as standards of maturity. *Special attention should be paid to the external appearance of these standard fruits, particularly the ground colour of the least coloured parts.* Each picker and packer should be then asked to pick a few apples to standard. These should be cut and tested to check his judgment. Once the standard has been fixed in the mind,

little difficulty should be found by experienced persons in selecting apples of approximately the same degree of maturity. *It is essential to remember that picking must be on the basis of maturity primarily and of size only secondarily.* Apples accidentally or unavoidably picked in a condition not up to the maturity standard should be culled by the packers from fruit to be exported or stored.

4. If the preceding recommendations are adopted, it must be remembered that it is assumed the apples will be cold stored within a few days of picking. If cold storage is delayed too long there is a danger of the fruit becoming over-ripe in store. This particularly applies to varieties like Jonathan which are very subject to Internal Breakdown or over-ripeness.

Acknowledgments.—Special acknowledgments for material assistance willingly granted in the course of this investigation are due to Mr. G. W. Wickens, State Superintendent of Horticulture; to Mr. T. Price, Manager Illawarra Orchard Company, Karagullen; and to Dr. E. S. Simpson, Government Analyst.

"THE JOURNAL OF AGRICULTURE"

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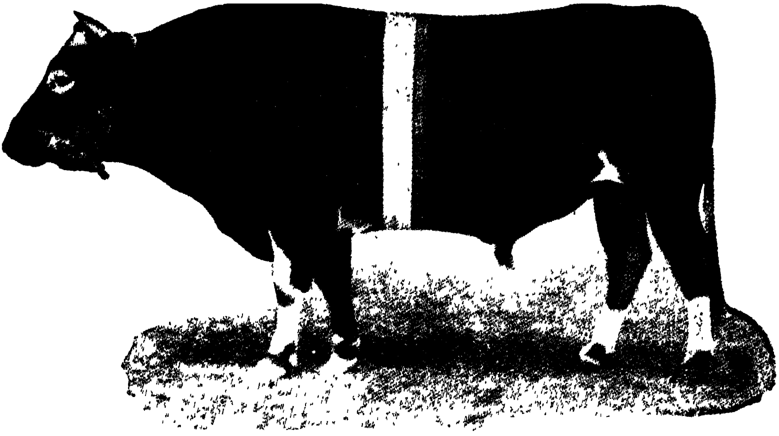
"ROSE CHIEF OF WOLLONGBAR."

THE VALUE OF "BREEDING."

P. G. HAMPSHIRE,

Superintendent of Dairying.

In dairy husbandry the slogan that is becoming generally adopted in Western Australia is "Breed," "Feed," and "Weed." There are some stockmen, however, who still believe that breeding is of little value in comparison with feeding, or in other words, that the breed is the feed the cow receives. The writer has always stressed the value of breeding as the basis of herd improvement. Feeding and weeding are the natural corollary.



"Rose Chief of Wollongbar" at 3½ years.

The value of breeding is remarkably exemplified in a study of the Guernsey sire "Rose Chief of Wollongbar," Registered No. 130, Volume II. of the Guernsey Herd Book of Australia. This bull was bred by the New South Wales Government, and was used for some seven years in their Guernsey stud at Wollongbar. Five years ago the West Australian Government purchased this sire, and placed him at the head of the Guernsey stud at Denmark, and now at the age of 12½ years the animal is still hale and hearty, and possessed of an abundant vitality. That this dairy sire, at an age approaching 13 years, should be still active and up to his work is a tribute to the care and management in his early years. However, an additional factor which, without doubt, greatly influenced the outstanding vitality of the animal is the longevity and productiveness of his dam, "Parson's Red Rose 1st" (imp.), Reg. No. 138, Volume I., who lived to the ripe age of 22½ years.

"Rose Chief of Wollongbar" is a remarkable instance of a dairy sire combining practically every desirable feature. In the first place, this bull is of outstanding breed type, being the Champion Guernsey Bull at the Royal Show, Sydney, twice, and at Perth; also winner in Bull and Progeny Class, Sydney, three times. In addition he is the sire of champion bulls and cows at Sydney. Sons, grandsons, and daughters have secured "Champion" ribbons on seven occasions. His daughters are of outstanding breed type and productivity, and his sons are also of distinct breed type and are "breeders" of type and production. Those who have studied animal breed will appreciate this all round excellence. Some sires may be noted for their outstanding daughters and others for the excellent calibre of their sons, but rarely do we find both male and female progeny of excellent character. Again, some sires breed type and are weak as regards production; others breed production, and are weak as regards type.

The accompanying tables set out the remarkable value of the daughters of this bull, together with the value of his stud sons as dairy sires.

"Rose Chief of Wollongbar's" sire and dam were imported from England. His dam "Parson's Red Rose 1st" is one of the outstanding animals of the breed, being the dam of excellent stock, as in addition to the bulls "Rose Chief of Wollongbar" and "Success of Wollongbar," she is also the dam of Parson's Red Rose 20th," which, under official test over 365 days, produced 1,302 lbs. butter, and is the second highest production Guernsey cow of the world. "Parson's Red Rose 1st" was over 16 years old when this phenomenally high production daughter was calved. This great "mother" of the breed was a high producer, but was not officially tested until over 14 years old.

An examination of the Herd Books discloses that "Rose Chief of Wollongbar" has 52 registered pure daughters. Of these, 30 have been officially tested, 16 are yet too young to be tested, 3 were sold to owners not testing, 3—unable to trace whereabouts. In addition to the pure-bred daughters, there are a considerable number of grade daughters which, however, have not been officially tested, but from observation are of exceedingly good type and production animals.

This great sire has also in this State 26 sons, 29 grandsons, and 12 great grandsons. The stud sons of this bull are "Judge of Wollongbar," "Bounty of Wollongbar," and "Renown of Wollongbar." These three bulls have distinguished records in the Sydney Royal Show ring.

The tables attached give in detail the yields of the daughters of "Rose Chief of Wollongbar" at the different ages up to 5 years, with the production of their dams at the same ages, together with the butter fat test of both the dams and daughters. A perusal of the tables discloses the marked improvement on an average of the daughters over the dams, also the phenomenal increase shown in the average butter fat test.

Table 2 shows the percentage increase in production of the daughters over that of the dams, together with average increase at the different ages.

Table 3 gives particulars of "Rose Chief of Wollongbar's" stud sons' daughters compared with their dams, together with the average butter fat test of the daughters and dams.

As previously referred to a most striking feature in connection with the breeding qualities of this dairy sire "Rose Chief of Wollongbar" is the fact that all his daughters average .63 per cent. greater in butter fat test, the dams averaging 5.22 per cent., the daughters 5.85 per cent. This is equal to an increase of 12 per cent. in the butter fat test.

Table 1.

ROSE CHIEF'S DAUGHTERS COMPARED WITH THEIR DAMS.

Yields of Butter Fat. Period, 273 days.

——	Registered No.	At 2 years.	At 3 years.	At 4 years.	At 5 years.	Butter-fat Test.
		lbs.	lbs.	lbs.	lbs.	%
Hope II.	647	391	...	522	...	5·7
Dam—Hope	280	198	...	324	756	5·8
Leonie IV.	667	345	394	365	...	5·3
Dam—Leonie II.	99	218	...	...	...	4·9
Desdemona III.	432	261	257	378	456	5·8
Dam—Desdemona (Imp.)	39	...	...	.	264	4·7
Annetta III.	589	300	...	...	...	6·1
Dam—Annetta	242	...	221	...	294	5·3
Godolphin Lass II	632	246	378	453	...	6·5
Dam—Godolphin Lass	454	...	...	...	...	...
Desma	433	258	239	...	...	5·7
Dam—Desdemona	264	211	...	...	426	6·0
Parson's Red Rose XIX.	729	227	...	318	352	5·9
Dam—Parson's Red Rose X.	344	...	...	252	307	5·0
Parson's Red Rose XVII.	528	220	239	...	334	5·7
Dam—Parson's Red Rose XI.	345	201	270	319	307	4·6
Mona III.	523	...	229	...	...	5·4
Dam—Desdemona (Imp.)	39	...	...	...	264	4·7
Dido IV.	434	...	216	292	264	5·2
Dam—Dido III.	266	229	263	309	402	4·8
Gertrude II.	1126	219	392	...	438	6·0
Dam—Georgina	449	...	261	...	...	5·3
Anna III.	796	264	355	...	334	6·4
Dam—Anna II.	417	228	279	279	394	5·5
Beatrix VII.	801	295	239	346	...	6·4
Dam—Beatrix IV.	244	156	...	...	271	5·5
Bel Air X.	803	256	...	...	...	5·7
Dam—Bel Air III.	14	...	256	...	...	5·1
Dido V.	829	264	...	302	...	5·2
Dam—Dido III.	266	229	263	309	402	4·8
Miss Clatford VIII.	916	232	...	...	...	5·2
Dam—Miss Clatford IV.	298	256	200	296	429	5·8
Opal II.	980	361	443	...	...	6·3
Dam—Opal	338	243	266	269	608	5·2
Parson's Red Rose XXVII.	982	...	544	558	...	6·7
Dam—Parson's Red Rose V.	340	232	243	...	361	5·8

TABLE 1—*continued.*

——	Registered No.	At 2 years.	At 3 years.	At 4 years.	At 5 years.	Butter-fat Test.
		lbs.	lbs.	lbs.	lbs.	%
Princess III.	992	194	...	...	...	5·8
Dam—Princess II.	354	...	...	303	...	5·1
Royal Souvenir 2nd ...	1002	232	313	...	...	6·1
Dam—Royal Souvenir	176	...	238	180	326	5·3
Chimes II.	1117	203	...	...	...	6·1
Dam—Chimes	428	247	...	...	407	5·0
Honor II.	1129	...	453	...	...	5·9
Dam—Honor	279	260	305	477	638	5·6
Parson's Red Rose XXXIII.	1137	274	...	...	...	6·1
Dam—Parsons' Red Rose V. ...	340	232	243	...	361	5·8
Parson's Red Rose XXXVI.	1140	264	...	...	...	5·6
Dam—Parson's Red Rose XI. ...	345	201	270	319	307	4·6
Parson's Red Rose XXXIX.	1142	259	...	...	...	5·7
Dam—Parson's Red Rose V. ...	340	232	243	...	361	5·8
Rose Velvet	1431	218	...	...	...	5·7
Dam—Velvet	774	...	243	320	407	4·5
Trust III.	1156	366	420	...	...	5·6
Dam—Trust II.	556	190	206	243	318	5·2
Red Rose	1357	282	...	...	...	6·0
Dam—Parson's Red Rose XXXI.	985	302	279	...	...	5·3

TABLE 2.

PERCENTAGE YIELDS OF BUTTER FAT OVER THAT OF DAMS, AT SAME AGE.

——	At 2 years.	At 3 years.	At 4 years.	At 5 years.	Butter Fat.	
					Gain.	Loss.
	%	%	%	%	lbs.	lbs.
Hope II.	+ 98	...	+ 61	...	391	...
Leonie IV.	+ 58	...	...	...	127	...
†Desdemona III.	...	...	...	+ 72	192	...
Annetta III.	+ 43	...	...	...	129	...
Desma	+ 22	...	...	...	47	...
Parson's Red Rose XIX. ...	...	...	+ 28	+ 14	111	...
*Parson's Red Rose XVII. ...	+ 9	— 9	...	+ 9	15	...
†Mona III.	...	+ 24	...	...	65	...
‡Dido IV.	...	— 17	— 5	— 34	...	—202
Gertrude II.	...	+ 50	...	...	131	...
Anna III.	+ 16	+ 20	...	— 15	52	...
Beatrix VII.	+ 95	...	...	+ 47	264	...
Bel Air	+ 19	...	...	...	50	...
‡Dido V.	+ 15	...	— 2	...	28	...
Miss Clatford VIII.	— 9	...	...	...	...	24
Opal	+ 47	+ 66	...	...	295	...
§Parson's Red Rose XXVII. ...	...	+123	...	+ 68	548	...
Royal Souvenir 2nd	...	+ 31	...	...	75	...
Chimes II.	— 17	...	...	...	...	44
Honor II.	...	+ 48	...	...	148	...
§Parson's Red Rose XXXIII. ...	+ 18	...	...	...	42	...
*Parson's Red Rose XXXVI. ...	+ 26	...	...	...	63	...
§Parson's Red Rose XXXIX. ...	+ 11	...	...	...	27	...
Red Rose	— 7	...	...	...	...	20
Trust III.	+ 92	+103	...	...	390	...
Rose Velvet	+ 10	...	...	...	25	...
Average Increase	30%	43·9%	20%	23%	3215 290	290
			Total Gain		2925	

* Sisters. † Sisters. ‡ Sisters. § Sisters. 39 lactations average 75lbs. fat more than their dams.

TABLE 3.

"ROSE CHIEF'S" STUD SONS.—"JUDGE OF WOLLONGBAR'S" DAUGHTERS COMPARED WITH THEIR DAMS.

Yields of Butter Fat.

—	Registered Number.	At 2 years.	At 3 years.	At 4 years.	At 5 year	Butter Fat Test.	Butter Fat.	Test.
		lbs.	lbs.	lbs.	lbs.	%	lbs.	
*Golden Pearl IV	863	385	449	351	..	5·8	+209	+ ·7
Dam—Golden Pearl III.	457	...	240	..	...	5·1		
Dinah II.	832	365	368	307	...	5·2	+157	+ ·6
Dam—Dinah	435	208	...	.	...	4·6		
Parson's Red Rose XXVIII.	983	.	341	.	363	5·4	+ 88	+ ·9
Dam—Parson's Red Rose XXII.	732	203	...	...	...	4·5		
Princess Vivid II.	994	...	209	...	.	5·6	— 5	+ ·8
Dam—Princess Vivid	538	164	.	...	.	4·8		
Dido VIII.	1122	330	.	.	..	5·9	+101	+1·1
Dam—Dido III.	266	229	263	309	402	4·8		
*Golden Pearl V.	1128	225	..		...	5·8	+ 35	+ ·7
Dam—Golden Pearl III.	457	..	240	.	..	5·1		
Godolphin Lass III.	1127	278	.	.	..	5·3	+ 33	— ·8
Dam—Godolphin Lass II.	632	245	378	...	...	6·1		
Miss Clatford IX.	1132	270	..	..	...	5·0	+ 28	— 6
Dam—Miss Clatford V.	520	242	..	...	320	5·6		
Miss Clatford X.	1133	229		...	.	5·7	— 25	.
Dam—Miss Clatford IV.	298	254	199	295	429	5·7		
Desdemona V.	1119	346		.	...	5·2	+ 85	—·4
Dam—Desdemona III.	432	261	257	378	334	5·6		
Bel Air XIV.	1382	356	..	.		5·9	+146	+1·1
Dam—Bel Air VII.	250	210		288	329	4·8		

"BOUNTY OF WOLLONGBAR'S" DAUGHTERS COMPARED WITH THEIR DAMS.

Yields of Butter Fat.

—	Registered Number.	At 2 years	At 3 years.	At 4 years	At 5 years	Butter Fat Test.	Butter Fat	Test.
		lbs.	lbs.	lbs	lbs.	%	lbs.	
Bonnie Pearl IV.	1165	346	...			5·6	— 39	— ·2
Dam—Golden Pearl IV.	863	385	449	351		5·8		
Chimes III.	1118	239		.	.	5·6	8	+ ·6
Dam—Chimes	428	247	.	..	407	5·0		
Dido IX.	1123	325	...	.	.	5·2	+147	+ ·2
Dam—Dido IV.	434	178	215	291		5·0		
Modesty II.	1134	..	162 (Sick)	...	..	5·7	..	+ ·8
Dam—Modesty	299	203	..	291	277	4·9		
Parson's Red Rose 40th	1143	347	...	.	..	6·1	—139	+ ·1
*Dam—Parson's Red Rose 20th	730	486	574	..	870	6·0		
Princess V.	1148	182		.	.	5·8	— 11	...
Dam—Princess III	992	193	...	.	.	5·8		

*Second highest producing Guernsey cow in the world.

"RENOWN OF WOLLONGBAR'S" DAUGHTERS COMPARED WITH THEIR DAMS.

Yields of Butter Fat.

—	Registered Number.	At 2 years.	At 3 years.	At 4 years.	At 5 years.	Butter Fat Test.	Butter Fat	Test.
		lbs.	lbs.	lbs.	lbs	%	lbs.	
Dessie II.	1121	220	...	...	...	5·3	— 31	+ ·2
Dam—Dessie	612	251	...	...	...	5·1		
Parson's Red Rose 34th	1138	...	506	..	...	5·6	— 68	— ·2
*Dam—Parson's Red Rose 20th	780	486	574	...	870	5·8		
Parson's Red Rose 38th	1141	337	...	...	...	5·9	+144	+ ·7
Dam—Parson's Red Rose 18th	728	...	193	230	...	5·2		

*Second highest producing Guernsey cow in the world.

TABLE 4.

ROSE CHIEF'S DAUGHTERS COMPARED WITH DAMS.

	Butter Fat. Average. lbs.
At 2 years—Daughters (16)	286
Dams (same age)	223
Increase	63
	lbs.
At 3 years.—Daughters (9)	375
Dams (same age)	259
Increase	116
	lbs.
At 4 years.—Daughters (5)	398
Dams (same age)	311
Increase	87
	lbs.
At 5 years.—Daughters (5)	348
Dams (same age)	334
Increase	14

ALL AGES.

	lbs.
Daughters (35) (74% under 3 years)	334
Dams (same ages)	260
Average Increase	74

All tests 9 months period.

BUTTER FAT TEST.

All Daughters (average)	5·85%	
All Dams (average)	5·22%	
Increase	·63%	equal to 12%

It will be noted, after perusal of the above tables, that they contain the records of production of all the daughters of "Rose Chief of Wollongbar" and do not, as is sometimes the case, show only the high producing daughters. It is without doubt the only satisfactory way to compare a sire's breeding value to obtain an average of all daughters as compared with their dams (at same age), and not the results of certain high-producing daughters.

'Rose Chief of Wollongbar'' at 12½ years.

In assessing the breeding value of this sire, it should be taken into consideration that the production records of the dams of "Rose Chief's" daughters were made some few years earlier than those of the daughters, and probably methods of feeding and management have improved to a certain extent which would account for some portion of the increased yield shown by the daughters. There is, however, one outstanding feature which feeding and management cannot influence, namely, that of the increased test shown by the daughters over their mothers. The average test of the mothers is higher than the average of the Guernsey breed, so that the influence of this sire in regard to butter fat test improvement is the more remarkable.

PHOSPHATIC LICKS FOR STOCK.

GEO. L. SUTTON,
Director of Agriculture.

Investigations carried out during comparatively recent years have shown how much more important, than was formerly considered to be the case, is an adequate supply of the mineral constituents such as Phosphorus, Calcium, Sodium, Potassium, Iron and Iodine in our stock foods. Though the amount of these in the food is relatively so small as to appear almost insignificant, the benefits to be derived from remedying any deficiencies, when they exist, are outstanding, and, in consequence, increasing attention is being given to the use of "stock licks" as being the best means of supplying the mineral constituents in which pastures may be lacking. Whatever may be the case regarding the lack of other mineral constituents, there is reason to believe that the natural pastures in the agricultural areas of Western Australia are deficient in phosphorus.

In the first volume of this "Journal"* attention was drawn to the phosphorus deficiency which evidently exists in the natural pastures of the South-West agricultural areas. It was then pointed out that certain troubles and diseases such as "Cripples" ("Styfsiekte" in South Africa), and Paralysis Impactum (Dry Bible), were directly or indirectly due to phosphorus deficiency in the pastures, and could be remedied by supplying phosphates in the food, or as "stock licks."

Further evidence as to the deficiency of phosphorus in our pastures is furnished indirectly by the remarkable response which our crops make to the application of soluble phosphatic fertilisers, *e.g.*, Superphosphate. This shows that the phosphorus content of our agricultural soils is low, and obviously such a condition will be reflected in the low phosphorus condition of our pastures. Support to this view is obtained from the information contained in an unpublished thesis by Eric J. Underwood, B.Sc. Ag., written as part of his work in connection with the "Amy Saw Scholarship." This thesis is based upon the result of a study of 26 pastures obtained from widely differing and widely separated portions of the central agricultural areas. The pastures were inspected and samples collected for analyses during Mid-Spring when the herbage was about half mature. Those obtained north of Perth in the Gingin, Geraldton and Northampton area were classed as Northern, and the others as Southern. Each of these sections was then divided into "Good" or "Poor," according to the reputation which each had from the stockman's point of view. The "good" pastures carry more stock and show better conditions of growth and fattening than the "poor."

In connection with the Southern group the author found that "the fibre and the lime contents are in general much higher, and the protein and phosphatic acid contents decidedly lower than the corresponding pastures of Great Britain," and further, "it is significant that even these "good" Western Australian pastures are lower in phosphoric acid and total protein than the poor Scotch hill pasture." In connection with the "poor" Southern pastures it is stated, "The figures for phosphoric acid are particularly low, and approach very closely to the figures given by Theiler and his co-workers as those at which chronic osteophagia develop in veldt cattle. Moreover, these workers have shown that the amount of phosphorus just required to prevent osteophagia is well below the optimum requirements for the cattle. The lack of phosphorus is, therefore, likely to be a limiting factor in growth, reproduction, milk yield, and fattening in stock grazed upon them.

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* **Adams, A. B.**—W.A. Jnl. of Agr., June, 1924.

With regard to the "good" Northern pastures the conclusions arrived at are--"When compared with the English and Scotch pastures it is seen that the "good" Northern pastures contain quite high percentages of lime, total ash and silica free ash, and fairly large amounts of protein. The figures for phosphoric acid are also nearer those given for the British pastures than in any of the Southern samples analysed." The conclusions connected with the "poor" pastures are—"In comparison with the British pastures these samples show quite a high proportion of lime, total ash and silica-free ash. The fibre content is also high, but the total protein very low indeed. The phosphoric acid percentages are each lower than are the average English and Scotch pastures, and with the exception of A5, previously mentioned, lower than the poor Scotch hill pastures."

Although the scope of the investigation on which the thesis was based was necessarily limited, it provides grounds for assuming that the stock on some of the reputed "good" pastures would, even in Spring, be better for the addition of supplementary phosphorus in some form, and that on the "poor" pastures the phosphorus content is so low—in some cases dangerously low—as to point to the absolute need for such an addition to the pasture.

The classical investigations of Sir Arnold Theiler and his co-workers in connection with a South African disease called "Lamsiekte,"* provide information from which additional evidence regarding the phosphorus deficiency of our pastures can be obtained. The investigators found that the direct cause of this disease was a toxin causing a ptomaine poisoning, but due indirectly to phosphorus deficiency in the pasture. This phosphorus deficiency led to a depraved appetite, in consequence of which the animals in mild cases chewed bones, or, in more advanced ones, ate carcase debris and so swallowed the toxin, which brought about the ptomaine poisoning. The trouble was remedied by feeding phosphates in the form of bonemeal. This removed the phosphorus deficiency, and, in consequence, the desire to chew bones or eat rubbish disappeared; there was then no toxin ingested, and no ptomaine poisoning. In this case the depraved appetite, as shown by the craving which the cattle had for bones and decomposing carcases, was the indicator or outward sign of the phosphorous deficiency in the pastures.

The depraved appetite due to a deficiency of phosphorus in the diet may exhibit itself in many ways. The animals may have a desire for excessive amounts of salt or for chewing bones, in which latter case it is known as "Osteophagia." In extreme cases it take the form of a craving for all sorts of rubbish, and the animal will then chew leather, rags, and even show a desire to lick tins and stones; it is then known as "Allotriophagia."

The South African investigators point out that "Osteophagia," or bone chewing, "is the most obvious outward sign, or clinical symptom, of phosphorus deficiency in cattle; and although not infallible, is a very valuable indicator of such deficiency in the majority of veldt-bred bovines. Curiously enough it is not shown to the same extent by other animals; is, for instance, only feebly manifested by sheep."

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* Theiler, Sir A.: "The Cause and Prevention of Lamsiekte"—Jnl. Agr. Union of Sth. Africa, June, 1920.

Seeing that the depraved appetite of bone chewing ("Osteophagia") is only feebly manifested by sheep, a case where sheep had passed beyond this stage and developed a craving for carcase debris ("Allotriophagia") furnishes evidence of extreme phosphorus deficiency in the pastures. Such an instance was reported from a district in the Wheat Belt during the past summer. In this case the carcases were those of poisoned rabbits, and a very general impression which prevailed in the district was that the mortality was due to the eating of the poison which had killed the rabbits. Following upon a request to the Veterinary Branch for advice and assistance, Mr. H. W. Bennetts, Veterinary Pathologist, definitely diagnosed the cases as those of "Botulism." He found that the mortality was not due to the rabbit poison, but that, like "Lamsiekte," in South Africa, it was directly the result of the ingestion of toxin, which the sheep obtained from the carcases as the result of infection with a bacterium, and indirectly due to a phosphorus deficiency in the pasture. The remedy prescribed was to destroy the carcases and improve the phosphorus deficiency of the pasture by the addition of another food or stock lick rich in phosphates. A bonemeal lick was recommended so that, by supplementing the diet with phosphorus, the deficiency would be removed, the unnatural craving for the rabbit carcases would disappear, the sheep would not ingest the toxin, and the mortality would cease.

Though the destruction of the carcases would have prevented a recurrence of the disease by preventing the sheep from obtaining the toxin produced by the saprophytic bacterium, which is the direct cause of the mortality, this treatment, though essential on hygienic grounds, is incomplete in that it does not remove the indirect cause of the trouble. viz., the phosphorus deficiency, hence the need for supplementing the food of the pasture with some compound of phosphorus as well as for the destruction of the carcases.

During the South African investigations into the phosphorus deficiency of pastures,* it was found that the phosphorus content was not uniform throughout the year. The investigators point out—"The following analyses of mixed grasses cut from the Armoedsvlakte veldt at different times of the year are of interest. A considerable proportion of the total vegetation consists of bushes and of plants rarely eaten by stock, but since the main food of the grazing cattle is derived from the grasses, only the analyses of these need be considered:—

Date	Crude protein.	Ether extract	N-free Extractives.	Crude Fibre.	Ash.*	P_2O_5.	CaO.*	Estimated energy value Starch = 100.	Ratio of starch equivalent to P_2O_5.
	%	%	%	%	%	%	%		
10 November, 1919 ...	19·4	5·5	41·0	22·5	11·6	·60	·31	56	100 : 1·07
8th December, 1919 ...	14·3	5·6	46·8	25·6	7·7	·32	·59	...	...
15th January, 1920 ...	13·8	5·5	48·0	25·0	7·7	·22	·50	52	100 : 0·42
4th March, 1920 ...	7·2	3·4	40·8	33·7	5·9	·24	·43	...	...
19th April, 1920 ...	4·9	2·4	51·6	35·0	6·1	·11	·46	32	100 : 0·33
11th May, 1920 ...	4·1	2·2	52·9	34·9	5·9	·07	·50	...	
8th June, 1920 ...	4·0	2·0	53·7	83·1	7·2	·09	·59	25	100 : 0·36
		European figures for comparison							
Rich pasture grass ...	20·5	4·6	45·9	19·0	10·0	·7	·9	60	100 : 1·16
Poor meadow hay ...	8·7	1·7	44·8	89·0	5·8	·4	·9	22	100 : 1·81

*Figures for Ash and CaO variable owing to contamination with dolomitic dust.

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* Theiler, Green & Du Toit: "Phosphorus in the Livestock Industry"—Sth. African Dept. Agr. Jnl., May, 1924.

"The data are expressed upon the dry matter of the plant, *i.e.*, after removing the moisture in a warm oven, in order to simplify comparison of feeding value and of phosphorus content. The very young green grass of early spring (October to November) it will be noted, is highly nutritious and has a fairly high phosphorus content, but after the seed has fallen (April to May) the general feeding value, or "energy value," is reduced to less than half, and then approximates that of a poor European hay. The most striking feature, however, is the extraordinary low phosphorus content, averaging about .08 per cent. phosphorus oxide (P_2O_5), or only one-fifth of that present in ordinary European hays. As the grass matures, carbohydrate formation in the plant proceeds so much faster than phosphorus absorption from the soil that the percentage of phosphoric oxide rapidly falls."

There is a considerable amount of similarity between the grazing conditions in South Africa and Western Australia. In both countries the pastures are alternately succulent and dry. In South Africa the flush or succulent period is in the spring and early summer, say, October to January, whilst in Western Australia the succulent period is in winter and early spring, say, May or June to September or October. Because of this similarity in the grazing conditions between the two countries, it is probable that the information obtained in South Africa, regarding the changes which take place in the mineral content of the pastures, would apply also to West Australian pastures. It is reasonable, therefore, to infer that our pastures as they become dry and lose their seeds become deficient in phosphorus, though when young, green and succulent the reverse may have been the case.

The tremendous importance of making good the phosphorus, if any, of our pastures is brought out by the South African investigations. Subsequent to the initial investigations in connection with "Lamsiekte," Sir Arnold Theiler and his co-workers found that phosphorus deficiency, in addition to being the indirect cause of disease and death, also had a very material and restrictive effect upon the growth and production of the animals they were dealing with, *i.e.*, veldt-grazed cattle. They found that the addition of phosphate to the natural pasture poor in phosphorus enabled young animals to make much better growth, and to use the food available to a much better advantage. In referring to the better growth obtained as the result of supplementing the pasture with phosphates in the form of bonemeal, they state: "Expressed as percentage increase on initial live-weight, the gains are naturally most striking with young animals. The chart shows that calves of 300 lbs. live-weight that have increased in weight to about 470 lbs. during the season on the natural grazing, and to about 640 lbs. when supplied with bonemeal." It will thus be seen that the increase in weight was doubled as the result of supplementing the natural pasture with a phosphate. Their conclusion regarding the more economical use of the food when the phosphorus deficiency was made good is: "It is quite clearly shown that although animals receiving a bonemeal ration do eat more food in putting on additional weight, they also give a much better return 'per unit of food consumed.' When the phosphorus deficient controls were coaxed to eat more food than required for mere maintenance, they simply 'combusted' the excess for no useful purpose. A functional, as well as a structural role, is predicted for phosphorus in cellular metabolism, and an analogy drawn with the 'vitamins.' The practical effect of this is that the stock-carrying capacity of the pasture is increased as the result of making good the phosphorus deficiency."

Even with the low milk-producing veldt cattle grazed on phosphorus deficient pastures it was found that the milk yield responded favourably to the addition of phosphate in the form of bonemeal, and that the batch receiving bonemeal averaged about 40 per cent. more milk. As the investigators point out, "Low phosphorus is, therefore, a limiting factor in milk production," and "With dairy stock the differences would unquestionably be much more striking."

More recent work by the same investigators* has shown that a phorporus deficient diet also restricts the rate of increase; of the control cows on a deficient phosphorus diet 51 per cent. calved; of the cows receiving a ration of bonemeal to make up the phosphorus deficiency, 80 per cent. calved normally, thus showing that the "calf crop" is increased as the result of making up he phosphorus deficiency. These later investigations† also show that when exposed daily to bright sunshine "Vitamine deficiency of the diets had no adverse effect. Exogenous requirements of cattle for vitamines A, B and C are so low that they are covered by a few pounds of poor quality roughage (*e.g.*, wheat straw), and therefore do not enter into consideration under any natural system of cattle rearing." The South African investigations were carried out with cattle, but there is no room for doubt that the evils consequent upon a phosphorus deficient diet would apply with equal force to sheep and other animals, as would also the benefits to be derived from supplementing such a diet with phosphorus in some form or other.

Though there is no direct evidence in this connection, it is reasonable to expect that phosphorus additions to a deficient diet would also have a beneficial effect upon the quality and quantity of wool produced. In this connection Sir Arthur Theiler, in his address on "Stock Diseases and their Prevention," stated: "I wish to mention that this (viz., phosphorus deficiency) has probably also some relation to the production of wool. Cattle which I experimented with and which were properly fed with a balanced mineral ration showed remarkable change in the skin, and a remarkable change in the gloss of the hair. So that it was quite evident that the covering of the animal was affected also, and affected to the advantage of the animal itself. I do not see why what took place in the cattle should not take place in another way, and which can be controlled in sheep.

Concisely stated the advantages of supplementing a phosphorus deficient diet with phosphatic stock licks, or in other ways are—

(a) Mortality and diseases directly and indirectly due to a phosphorus deficiency in the diet are prevented;

(b) Young animals are enabled to make maximum growth;

(c) Young and older animals are enabled to make the most economical use of the food available:

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* Theiler, Green & Du Toit—Jnl. Agric. Science, July, 1928.

† Theiler, Green & Du Toit—Jnl. Agr. Science, July, 1927.

(d) Milk production is increased:

(e) Wool production is probably improved, and

(f) The rate of natural increase is raised.

It is believed that there is now abundant evidence to show—

(a) That in our agricultural areas, except in the very best pastures, there is a deficiency of phosphates in the natural feed, and particularly when the feed is dry;

(b) That in view of the South African investigations there is an urgent need to remedy the deficiencies, and

(c) That it is extremely profitable to do so.

In connection with (a) it seems advisable to conclude that all *dry* pastures, and particularly cereal stubbles, unless they contain an abundance of clover seeds or other leguminous grains, are likely to be deficient in phosphorus, and, in consequence, need to be supplemented with "phosphatic stock licks" or other foods rich in some phosphorus compound.

It seems probable also that heavy producing milch cows, even when feeding on clover pasture, particularly if dry, will require to have it supplemented with some food rich in phosphorus like bran or bonemeal, for during the investigations already referred to in connection with the prevention of "Lamsiekte" it was found, curiously enough, that the feeding of lucerne hay (*i.e.*, hay similar to clover hay) was not as effective as either bran or bonemeal, though the phosphorus content of the lucerne hay was just as high as that in the bran or bonemeal.

The phosphorus deficiency in our pastures can be remedied mainly in two ways—

(a) By top-dressing with suitable phosphatic fertilisers, and

(b) By supplementing the pasture with phosphatic licks or other food containing phosphates.

Where the land is valuable enough to warrant it, as in agricultural areas, both methods should be adopted, and in such cases the use of phosphatic "stock licks" will then be confined to the months when the feed is dry, except probably in the case of high producing milking cows. In some cases, as for instance, where the land is of low carrying capacity owing to arid conditions, top-dressing with phosphatic fertilisers may not be an economical way of remedying the phosphorus deficiency in the pastures, it is then necessary to make up the deficiency by means of "phosphatic stock licks."

From the results of the South African investigations* apparently any phosphorus compound will prove efficient as a "stock lick" provided it is assimilable and convertible into the form of phosphate," and further, that "calcium phosphate can take the place of bonemeal, and this compound is quantitatively superior to bonemeal if fed as precipitated calcium phosphate, but inferior if fed as ground mineral phosphate. Not only the quantity of phosphate must be taken into consideration, but also its availability........Whatever substance is fed it seems that the common factor of phosphorus must always be present. The behaviour with pure phosphoric acid indicates that the base in combination is unimportant, except in so far as it affects the absorption and utilisation of the compound itself. The compromise between "cheapness" of compound and "efficiency per unit of phosphoric acid" has not yet been worked out.

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* Theiler, Sir Arnold: "The Cause and Prevention of Lamsiekte."—Jnl. Dept. Agr., Sth. Africa, June, 1920.

Some years later it was stated that the best and cheapest method of supplementing the phosphorus deficient diet of grazing cattle under South African conditions was by no means of bonemeal. It was also found that bran was excellent but expensive—"The phosphorus contained in bran and in bonemeal can be treated as about equally available in digestion, and the two sources therefore evaluated on the basis of their phosphorus content; 1 oz. of bonemeal being as useful in rectifying phosphorus deficiency as about 1 lb. of average South African wheaten bran." Owing to the high cost of bran "per unit of phosphorus" it only comes into consideration in practice when a definite value is placed upon it as an ordinary supplementary feed in a mixed ration, *e.g.*, for dairy cows."

The same conclusions regarding the advisability and economy of feeding bran to remedy phosphorus deficiencies will also apply in Western Australia but not with regard to bonemeal. For feeding to stock the bonemeal requires to be sterilised in order to prevent the spread of infectious stock diseases, and on that account it is expensive costing £21 per ton in the Metropolitan area. When compared with the price of mineral phosphates its cost in this State is relatively greater than in South Africa. Its use, therefore, does not provide the necessary compromise between "cheapness" and "efficacy per unit of phosphoric acid." It is believed that this will be supplied in the future by a specially prepared and comparatively cheap precipitated calcium phosphate. In the meantime, however, two calcium phosphates are on the market, the cost of which is less than 1/3rd that of sterilized bonemeal. These are recommended pending the time when either a precipitated calcium phosphate or a cheaper bonemeal will be available. The two calcium phosphates referred to are Basic Superphosphate and finely ground Rock Phosphate. In both the relative proportion of Phosphorus to Lime is the same as in bonemeal. Basic Superphosphate has the advantage that it contains precipitated calcium phosphate, but its disadvantage is that it also contains about 50 per cent. of Gypsum, which as far as is known serves no useful purpose and must be regarded as an adulterant. Rock Phosphate has the advantage that it contains a greater percentage of phosphorus, but in the South African experiments it proved less effective per unit of phosphorus than bonemeal. How much less effective with cattle and sheep is not known, but in some experiments with pigs* it was found that Rock Phosphate was about 25 per cent. less efficient than specially prepared bone flour.

Either compound my be used separately, but with the object on the one hand of reducing the amount of adulterant in the Basic Superphosphate, and on the other of improving the efficiency of the Rock phosphate a mixture of the two in equal proportions may be adopted, as is the case in at least one proprietary "stock lick." Both compounds are likely to be unpalatable to sheep and cattle, and as the likes and dislikes of animals are matters of importance when licks are fed separately from the ration, it will be necessary to mix them with something to increase their palatability. Molasses is likely to prove useful in this connection, as is also salt, and in many cases this latter will also prove a useful addition.

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* "Utilisation of Calcium Compounds in Animal Nutrition."—Bull. 347 Ohio Expt. Stn., March, 1921.

So that the proportion of salt may not be unduly large, and thus prevent the animals from obtaining from the lick all the phosphorus they need, it is suggested that salt be added in proportions of one part for every two of the phosphate, and that to this be added about 12 per cent. of molasses. The approximate proportions of such a lick would be :—Basic Superphosphate or Ground Rock Phosphate, 10 parts; Salt, 5 parts; Molasses, 2 parts; and to make 1 cwt. the amounts would be:—

SUGGESTED PHOSPHATIC STOCK LICKS.

Materials.		A.	B.	C.
		lbs.	lbs.	lbs.
Basic Superphosphate	10 parts	66	...	...
or				
Ground and Rock Phosphate ...	,,	...	66	...
or				
Basic Superphosphate and	5 parts	...	...	33
Ground Rock Phosphate		...	...	33
Salt	,,	33	33	33
Molasses	2 parts	13	13	13
		112	112	112

Should the stock at first not take readily to the mixture the addition of a little more molasses may help matters, or even more salt may be added until the animals become accustomed to the lick, when the salt may be gradually reduced to the original quantity.

Superphosphate will also remedy phosphorus deficiency; its use, however, is not recommended as the South African experience indicates that it is likely to lead to digestive troubles.

Superphosphate can be made into Basic Superphosphate by mixing it with quick lime freshly slaked to a powder, or with air-slaked lime, the former being preferred. The amount of lime necessary for the purpose depends upon its degree of purity. Assuming 80 per cent. purity the approximate proportions would be—Superphosphate 4½ parts and quick lime 1 part If air slaked lime is used the proportions would be superphosphate 2½ parts and air slaked lime 1 part. The mixing of superphosphate and lime is not recommended, it is better to purchase the basic superphosphate already prepared.

Stock need a "lick" most when the feed is dry, and when they are carrying or rearing calves or lambs; they need it least when the feed is green, but even in this latter case a "phosphatic stock lick" can do no harm, and is likely to be of benefit. The amount of phosphorus to be supplied in the form of a "lick," if the animals are on pasture, or as a supplement to the food if they are hand fed, depends upon the extent of the deficiency in the pasture or feed and upon the character of the animals. As pointed out by Sir Arnold Theiler and his co-workers, "The demands for phosphorus are least for mere maintenance, intermediate for growth, and highest for milk production." For the conditions under which investigations were conducted the amounts recommended were ½ lb. of bonemeal, or its equivalent, per head per week for adult bullocks and young calves, ¾ lb. for growing stock over 300 lbs. in weight, or up to 2 lbs. or even more for milking cows. The ration is preferably given in the form of daily portions, or at least tri-weekly; bi-weekly or weekly portions are wasteful and ineffective. For milking cows and hand fed animals the ration is best given mixed with the feed.

Even in good pastures, if desired, a simple "phosphatic stock lick" can be left with the stock throughout the year. No fear need be felt that the animals will obtain too much, or an injurious quantity of, phosphorus. An amount of calcium phosphate in excess of their normal requirements will not hurt them; and if they do consume more than is needed to make up the deficiency in the pasture, such excess will be returned to the soil in the excreta, and have the same effect as top-dressing the pastures with a phosphatic fertiliser.

Because of the great importance of remedying phosphorus deficiency in the pastures of the agricultural areas, and the fact that the deficiency can be remedied by some form of calcium phosphate, it is probable that mineral phosphates, either untreated or treated, will have the same beneficial effect upon the well being of our stock as they, in the form of superphosphate, have had upon the productivity of our wheat fields and pastures.

It is important to emphasise that the fundamental reason for using stock licks is to make up deficiencies that are known to exist in the food. In as far as they serve this purpose they are useful and advisable, but in most cases they are wasteful and may even be harmful if they supply materials which are not lacking. It is, therefore, not advisable to use, without veterinary advice, licks which contain ingredients which are not known to be required to make up deficiencies in the diet. At present there is no definite information to indicate that generally there is any deficiency in our pastures other than that of phosphorus, and, in consequence, the only known need at present is for a straight "phosphatic stock lick."

SOIL ALKALI.

L. J. H. TEAKLE,

Plant Nutrition Officer.

I.—ITS NATURE AND OCCURRENCE.

In view of the importance of "alkali" on many farms in Western Australia, a series of articles is being prepared to state the underlying principles connected with "salt" accumulation and to indicate what measures may be adopted to mitigate the evil. Most of the studies on "alkali" in other parts of the world have been in connection with irrigation practice, and the results and recommendations are often not applicable to Western Australian conditions owing to a lack of water for leaching purposes. The alkali problems of Western Australia must be tackled from another standpoint—that of the dry-farm farmer—and the measures adopted will be conditioned by—

1. The value of the land.
2. The use to which the land is suited.
3. The topographical and climatic features of the area.
4. The nature of the soil affected.

Definition.—The term "alkali" is somewhat loosely applied, but most authorities agree in the following definitions:—

Alkali refers to soluble materials which exist in the soil in excessive amounts.

(a) *White Alkali* consists of one or more of such salts as sodium chloride (common salt), sodium sulphate (Glauber's salts), sodium nitrate (Chili saltpetre), magnesium sulphate (Epsom salts), magnesium chloride, calcium chloride, and perhaps others under exceptional conditions.

(b) *Black Alkali* consists of sodium carbonate, commonly known as washing soda or sal soda.

In Table 1 and Table 2 are given figures showing the composition of the alkali salts in soils in the United States and other parts of the world.

TABLE 1.—PERCENTAGE COMPOSITION OF ALKALI SALTS IN SOILS

(Lyon, Fippin and Buckman "Soils," 1916, p. 393.)

—		Colorado Expt. Station.	California (Tulare Exp. Sta.	Yakima, Washington, 12–24in.	Billings, Montana.		Yuma, Arizona.	
					Crust.	Surface 10in.	Crust.	0-72in.
White Alkali—								
Potassium chloride	.. **KCl** ...	1·64	...	5·61	...	..	4·00	22·10
Potassium sulphate	... **K_2SO_4** ...	...	3·95	...	1·60	21·41	...	...
Sodium sulphate	... **Na_2SO_4** ..	..	25·28	...	85·57	35·12	...	...
Sodium nitrate ...	... **$NaNO_3$** ..	33·07	19·78	...	...	...	...	...
Sodium chloride..	... **NaCl** ...	6·61	14·75	...	0·55	...	81·15	13·77
Sodium phosphate	... **Na_2HPO_4**	..	2·25	...	...	...	...	...
Magnesium sulphate	... **$MgSO_4$** ...	...	..	...	8·90	4·06	...	6·88
Magnesium chloride	... **$MgCl_2$** ...	12·71	..	...	..	...	7·71	3·98
Calcium chloride	... **$CaCl_2$** ...	17·29	..	...	..	...	0·25	...
Sodium bicarbonate	... **$NaHCO_3$** ...	...		36·72	0·67	22·06	0·28	21·02
Calcium sulphate	... **$CaSO_4$** .	21·48	.	1·87	2·71	10·07	6·61	32·25
Calcium bicarbonate	.. **$Ca(HCO_3)_2$**	...	...	16·48	...	...	..	...
Magnesium bicarbonate	**$Mg(HCO_3)_2$**	...	.	15·73	...	...	...	...
Ammonium carbonate ...	**$(NH_4)_2CO_3$**	...	1·41	...	...	...	..	...
Black Alkali—								
Sodium carbonate	.. **Na_2CO_3** ...		32·58	13·86	..	7·28	...	...
Potassium carbonate	. **K_2CO_3** ...	..	..	9·73	.	..	...	...

TABLE 2.—COMPOSITION OF THE SOLUBLE ALKALI IN VARIOUS COUNTRIES.

(From Bulletin 35, Bureau of Soils 1906. "Alkali" Soils of the United States, by C. W. Dorsey, page 35.)

—	White Alkali.						Black Alkali.
	Potassium sulphate (K_2SO_4).	Sodium sulphate (Na_2SO_4).	Sodium chloride (NaCl)	Sodium phosphate (Na_3PO_4).	Magnesium sulphate ($MgSO_4$).	Magnesium chloride ($MgCl_2$).	Sodium carbonate (Na_2CO_3).
EUROPE—	per cent.	per cent.	per cent	per cent.	per cent.	per cent.	per cent.
Hungarian Plain—							
Kalocsa ...	...	0·2	51·7	...	...	..	48·1
Debreczin ...	..	1·6	4·4	1·5	..	..	92·5
ASIA—							
Plain of the Araxes	...	10·4	74·6	...	...	...	14·7
	...	18·2	69·7	...	...	...	12·1
	...	15·5	15·5	.	...	...	69·0
Aden	...	...	32·8	...	..	...	67·2
India	11·1	7·0	2·9	...	...	..	79·0
AFRICA—							
Egypt	...	23·6	48·2	...	...	...	28·2
	...	38·3	14·0	...	...	...	47·7
Fezzan	..	·6	·7	...	...	...	98·7
AUSTRALIA—							
Bendigo	1·28	40·05	47·47	...	11·20	...	...
	1·63	...	81·88	...	9·86	6·73	...

White alkali is harmful on account of its effect on the plant and on the soil; its presence makes it difficult or impossible for the plant to absorb water from the soil, and, if in sufficient quantities, will kill the delicate cells of the rootlets. In addition a chemical reaction takes place between the clay of the soil and sodium of the alkali. Unless there is an adequate amount of calcium present this reaction goes so far that the normal calcium clay turns to a sodium clay which is gelatinous and very harmful to plants as well as being impossible for proper cultivation.

Black alkali is formed from this gelatinous clay by the action of water and carbonic acid. Water acts on the clay, forming small amounts of sodium hydroxide (the ordinary lye used in making soap). By the action of carbonic acid dissolved in the soil water the sodium hydroxide is changed to sodium carbonate or black alkali. Thus black alkali, the most harmful of all common forms of alkali, may be formed from white alkali if the soil is poorly supplied with soluble calcium.

Origin of Alkali.—All forms of alkali are derived from rock weathering, and, being soluble, tend to be washed to lower levels with water movement. Accumulation occurs in inland seas, lakes and, principally, in the ocean. There is also a movement of soluble salts in the air where they exist as very fine dust derived from sea spray, and from the surfaces of saline accumulations such as alkali spots and salt lakes. The air borne salts are washed down by rains and accumulate in the soil. There is a possibility of this wind-carried material being responsible for the salinity of soils in certain areas of the world. In other areas, the alkali is definitely residual, resulting from the evaporation of inland bodies of water due to a change in the climate of the region.

Occurrence of Alkali.—Practically all countries receiving a low annual rainfall have an alkali problem to a greater or lesser degree. Contributions to the subject come from the Central European countries, Africa and America in particular. In the future Australia will add to the literature on soil alkali because the greater part of the area of Australia receives a rainfall under 20 inches per annum, under which conditions there is a decided tendency for soluble materials to accumulate in the soil. This is because the loss by drainage is less than the gain due to soil and rock weathering plus additions by the avenue of the atmosphere. The soluble materials normally accumulate in the soil in a layer at a distance below the surface depending on the annual rainfall and the permeability of the soil.

The results of analyses of alkali-affected soils in various parts of the world are reported in Table 3. These figures bring out the effect of the texture of the soil as well as the annual rainfall.

TABLE 3.—DEPTH OF ACCUMULATION OF SOLUBLE SALTS (ALKALI) IN SOILS.

Locaility.	Rainfall.	Depth.	Soil texture.
Fresno, California	8in.	3 to 4 feet	Sandy loam.
Do.	"	4 " 8 "	Coarse sand.
Imperial Valley, California	3in.	15in.	Sandy loam.
Ventura Co., California	15in.	5 feet	Sandy loam.
Grand Forks, North Dakota ...	20in.	3 "	?
Gezira, Egypt	15in.	3 to 5 "	Heavy clay.

This applies to clay and calcium carbonate as well as to alkali. It is well known that the subsoil (technically known as the B. horizon of the soil) is generally more clayey in character than is the surface soil. Also, the subsoil in districts of low rainfall will generally effervesce strongly with dilute acid (spirits of salt mixed with several volumes of pure water), while the surface soil gives no reaction. The calcium of the surface layers of the soil is thus leached out by the rains and deposited in the subsoil. This deposit of calcium carbonate, clay and alkali indicates at least two things. First, that the average rains do not saturate the soil below a certain depth. Second, that the normal tendency is for the soluble materials to move *downwards* with the moisture.

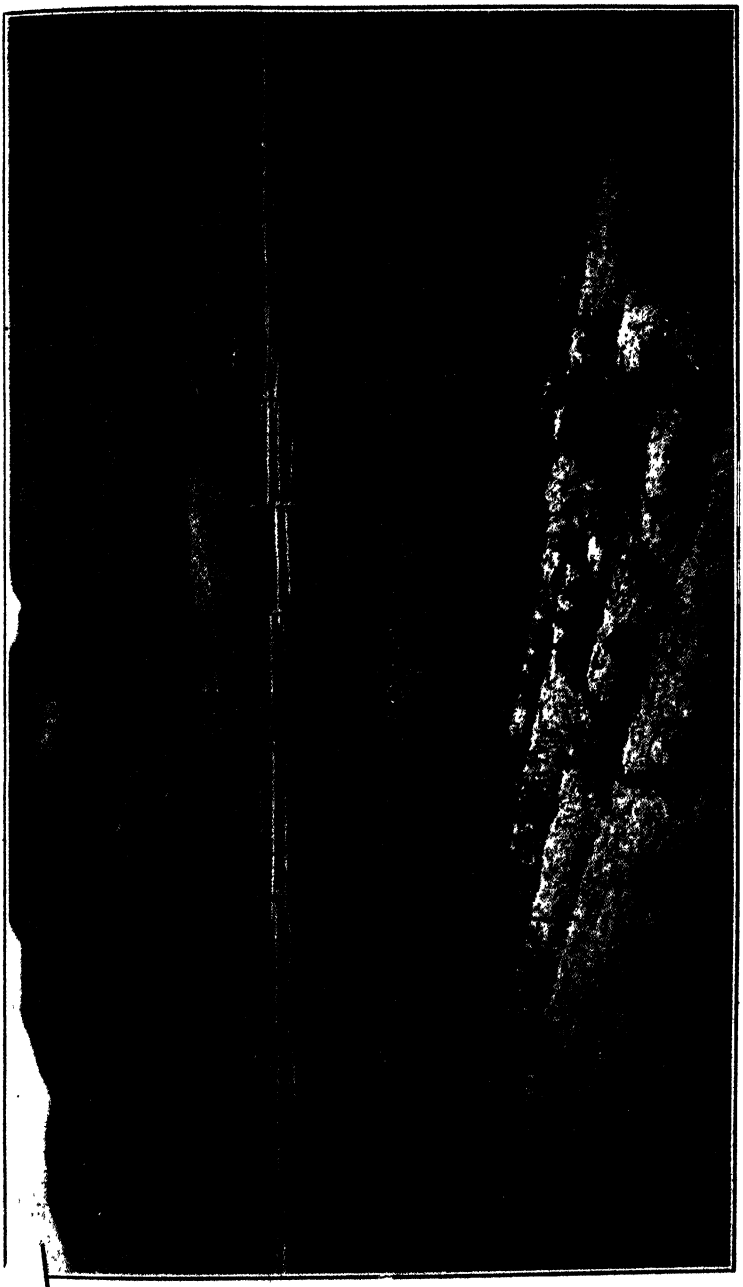
Through the ages the water absorbed by the soil either evaporates through the medium of the vegetation and through surface evaporation, or seeps away to feed the lakes, rivers and swamps, carrying with it soluble material dissolved from the soil. The extent of this latter process is well exemplified by the salt lakes which intersect Western Australia and South Australia. When it is remembered that these accumulations have taken place during the period in which the country has been covered with forest, it will be predicted that areas of these "lakes" will increase following the destruction of the natural vegetation, leading to an increase in salt accumulations in the lakes and other drainage areas.

The alkali problem is most acute in countries where the seepage is further augmented by irrigation. Irrigation without adequate drainage invariably leads to a rise in the water table, which is a danger signal. With a water table within three to six feet of the surface, the difficulty of obtaining an adequate soil mulch is extremely great, and the alkali is brought to the surface by the capillary processes of the soil. On evaporation of the water at the surface of the soil the saline material remains in the surface layers and may accumulate to the extent of as high as six per cent. of the mass of the soil. The alkali problem is acute in certain localised areas in places enjoying a rainfall of 20 to 30 inches per annum. Clearing the timber leads to a rise of the water table in the creeks and the formation of more or less permanent springs and damp areas at places where an impervious layer comes to the surface. In areas of lower rainfall, moisture movement, and with it the movement of soluble materials, is limited and slow so that it is probable that the condition will never be so acute in its incidence in these districts. It will, however, be of much more general occurrence for the reasons given above.

II.—THE TOLERANCE OF PLANTS FOR ALKALI IN SOILS.

Some classes of soil are infertile on account of the absence of an adequate supply of soluble materials This will apply to certain sandy soils in Western Australia. Alkali soils are infertile on account of the excessive concentration of soluble salts in the soil solution. Most farmers in Western Australia are familiar with the occurrence of "salt" patches—often ascribed to "magnesia."

Plate I. shows a typical alkali spot in a field of oats in the State of Utah, United States of America.



Small alkali spot remaining in a field reclaimed by irrigation in the Sevier Valley, Utah. Before reclamation no cultivated crop could be grown.

United States Department of Agriculture, Bulletin 34, 1906.

It has been estimated that nearly one million acres of irrigable land, amounting to ten per cent. of the total area under irrigation in the United States, has been ruined by the occurrence of alkali. The State of California, which depends largely on irrigation water for its farm and orchard supply, has had to face a very severe alkali problem, and its investigators have been studying the question during the last 35 years.

A summary of the results obtained by Loughridge (Bulletin 133, California Experiment Station, 1901) is published by C. W. Dorsey in Bulletin 35, Bureau of Soils, U.S. Department of Agriculture, 1906, pages 41 and 42, and is reproduced in this article for the guidance of those interested:—

TABLE 4.

Highest quantity of alkali salts to a depth of 4 feet by which fruit trees and various crops were found unaffected—arranged from the highest to the lowest.

Fruit Trees.

Sulphates (Glauber's salt)—	lbs.
Grapes	48,800
Olives	30,640
Figs	24,480
Almonds	22,720
Oranges	18,600
Pears	17,800
Apples	14,240
Peaches	9,600
Prunes	9,240
Apricots	8,640
Lemons	4,480
Mulberry	3,360

Carbonate (sal soda)—	lbs.
Grapes	7,500
Oranges	3,840
Olives	2,880
Pears	1,760
Almonds	1,440
Prunes	1,360
Figs	1,120
Peaches	680
Apples	640
Apricots	480
Lemons	480
Mulberry	160

Chloride (common salt)—	
Grapes	9,640
Olives	6,640
Oranges	3,360
Almonds	2,400
Mulberry	2,240
Pears	1,360
Apples	1,240
Prunes	1,200
Peaches	1,000
Apricots	960
Lemons	800
Figs	800

Total alkali—	
Grapes	45,760
Olives	40,160
Almonds	26,560
Figs	26,400
Oranges	21,840
Pears	20,920
Apples	16,120
Prunes	11,800
Peaches	11,280
Apricots	10,080
Lemons	5,760
Mulberry	5,760

Table 5.

Highest quantity of alkali salts to a depth of 4 feet by which fruit trees and various crops were found unaffected—arranged from the highest to the lowest.

Small Cultures.

Sulphates (Glauber's salt)—	lbs.
Saltbush	125,640
Alfalfa (old)	102,480
Alfalfa (young)	11,120
Hairy vetch	63,720
Sorghum	61,840
Sugar beet	52,640
Sunflower	52,640
Radish	51,880
Artichoke	38,720
Carrot	24,880
Gluten wheat	20,960
Wheat	15,120
Barley	12,020
Goat's rue	10,880
Rye	9,800
Caniagre	9,160
Ray grass	6,920
Modiola	6,800
Bur clover	5,700
Lupin	5,440
White melilot	4,920
Celery	4,080

Carbonate (sal soda)—	lbs.
Saltbush	18,560
Barley	12,170
Bur clover	11,300
Sorghum	9,840
Radish	8,720
Modiola	4,760
Sugar beet	4,000
Gluten wheat	3,000
Artichoke	2,760
Lupin	2,720
Hairy vetch	2,480
Alfalfa	2,360
Grasses	2,300
Kafir corn	1,800
Sweet corn	1,800
Sunflower	1,760
Wheat	1,480
Carrot	1,240
Rye	960
Goat's rue	760
White melilot	480
Canaigre	120

Chloride (common salt)—	
Madiola	40,860
Salt bush	12,520
Sorghum	9,680
Celery	9,600
Alfalfa (old)	5,760
Alfalfa (young)	760
Sunflower	5,440
Sugar beet	5,440
Barley	5,100
Hairy vetch	3,160
Lupin	3,040
Carrot	2,360
Radish	2,240
Rye	1,720
Artichoke	1,480
Gluten wheat	1,480
Wheat	1,160
Grasses	1,000
White melilot	440
Goat's rue	160
Canaigre	80

Total alkali—	
Salt bush	156,720
Alfalfa (old)	110,320
Alfalfa (young)	13 120
Sorghum	81,360
Hairy vetch	69,360
Radish	62,840
Sunflower	59,840
Sugar beet	59,840
Modiola	52,420
Artichoke	42,960
Carrot	28,480
Barley	25,520
Gluten wheat	24,320
Wheat	17,280
Burr clover	17,000
Celery	13,680
Rye	12,480
Goat's rue	11,800
Lupin	11,200
Canaigre	9,360
Ray grass	6,920
White melilot	5,840

The results are expressed in pounds per acre in 4 feet depth. In order to calculate these to a percentage basis it must be remembered that an acre foot of soil weighs about 3½ to 4 million pounds. These tables provide a considerable amount of detail concerning the tolerance of various plants of agricultural importance for alkali. For general use, however, the table suggested by the United States Department of Agriculture is of greater value because it is very concise and based on a great deal of experience.

TABLE 6.

Grades adopted by the U.S. Department of Agriculture with regard to alkali soils.

Grade.	Total Salt per cent.	Crop behaviour.
1	Up to 0·2 per cent.	All uninjured.
2	0·2 „ 0·4 „	Sensitive plants injured.
3	0·4 „ 0·6 „	Ordinary crops injured. Some pasture plants, sugar beets, barley and sorghum grow.
4	0·6 „ 1·0 „	Date palms and atriplex.
5	1·0 „ 3·0 „	No crops grow.
6	Over 3·0 „	No crops grow.

It is suggested that the soil be sampled to a depth of six feet and the average of the salt contents of the successive layers of one foot be taken as representative of the soil.

Experience has shown that the crop plants may be grouped as follows:—

1. *Sensitive plants*—maize, wheat, young lucerne, burr clover, lupins, peach, orange, prunes, etc.
2. *Resistant plants*—oats, barley, Kafir corn, sorghum, beet, grapes, olives, etc.
3. *Very resistant crops*—Saltbush (*Atriplex spp.*), date palms, couch grass, etc.

Certain plants are recognised as being indicative of salt-bearing soil. Thus saltbush is very generally associated with soils containing excessive amounts of salt according to observations made in America as well as in Australia. No infallible guide is known, however, as there are numerous cases on record of plants, regarded as salt indicators, growing on soils unaffected by alkali. Land carrying saltbush in areas known to be *liable* to "salt" would always be regarded with suspicion pending actual analysis of representative samples.

Factors in Salt Tolerance.—The actual amount of "salt" which any crop will tolerate is conditioned by a number of factors.

If there is an abundant supply of water in the soil much more alkali may be present without causing any injury. Thus the Arabs are able to grow sensitive plants in the oases by using a very liberal and frequent application of water, although the water used is quite saline.

Quite closely associated with the supply of water is the atmospheric factor. Under conditions of high evaporation plants will be likely to be more damaged by alkali than when cool and moist conditions prevail.

Another factor is that of soil drainage. The Arabs find it safe to use quite saline water on the sandy soils of the oases because the drainage is perfect and there is no chance for the soluble matter to increase. With slow or poor drainage conditions the results would be disastrous.

Soil texture is a very important consideration and must be viewed from two aspects, viz., the effect of added alkali and the effect of alkali already present.

Sandy soils, on account of their free drainage and low content of clay will be less injured by water containing considerable amounts of soluble salts than will clay soils. On the other hand a sandy soil can safely carry less alkali than a clay soil. The sandy soils hold much less water than do clay soils—probably half as much. This means that at the optimum moisture condition the soil solution, the solution with which the plant roots are bathed, is just twice as concentrated in the sandy as in the clay soil. It is thus clear why a smaller percentage is injurious in a sandy soil.

The percentage composition of the alkali present is very important. Magnesium salts are very injurious. Sodium carbonate is quite injurious on account of its corrosive effect on the plant roots, causing them to turn black. 0.1 per cent. sodium carbonate is suggested as the maximum for cereals. Common salt or sodium chloride is somewhat less toxic, the limit for cereals being about 0.25 per cent. Most plants can withstand about twice as much sodium sulphate (Glauber's salts) as sodium chloride. Hilgard suggests that cereals will tolerate as much as 0.45 per cent. sodium sulphate.

The Effect of Alkali on Plants.—It is well known that alkali in large amounts will prevent the germination of seeds. Very often the seeds sown on land affected with alkali will germinate, but the young seedlings are killed by the high conceneration of the soil solution. As a rule, older plants are much more resistant than seedlings. Perhaps the roots have penetrated beyond the zone of alkali accumulation and the delicate root hairs thus escape the effects.

Plants absorb water mainly through the roots. It enters the root cells by a process known as osmosis whereby the water passes from a dilute solution to a concentrated solution. If it happens that the soil solution is *more* concentrated than the root sap the water will tend to pass *from* the root *to* the soil.

The result of this will be the death of the root cells and later the death of the plant.

It has been observed that when grown in saline soils wheat, oats and barley plants appear a bluish green. This is probably due to the waxy coating or cuticle on the leaves which is about one and a half times as thick as on plants grown under normal conditions.

In certain experiments undertaken by the writer (data unpublished) it was found that high concentrations of common salt in the solutions in which wheat plants were grown, caused a decided increase in the rate of respiration of the plants. This may be a factor contributing to the bad effects of alkali on plants.

Not only do different types of plants differ in their tolerance of alkali but individuals of the same variety differ greatly in this respect. In experiments with alkali soils it is almost invariably noticed that a few plants stand out from the rest. Attempts have been made to use the seed from these plants for the production of alkali resistant varieties but with no success up to the present.

Alkali Tolerance and Adaptation.—In an interesting article (Univ. of Arizona, Agricultural Experiment Station, Technical Bulletin No. 11, 1926), J. F. Breazeale argues that the alkali tolerance of plants is a matter of adaptation. Throughout the ages types of plants become adapted to the conditions of their environment. Thus saltbush has become adapted to conditions of low rainfall and high salinity. The marine algae (seaweeds) flourish best in seawater. Wheat grows best in soils containing relatively small amounts of soluble salts. The salts commonly present in alkali soils arrange themselves in approximately the following order of *decreasing* toxicity:—

1. Magnesium sulphate.
2. Magnesium chloride.
3. Sodium carbonate.
4. Sodium bicarbonate.
5. Sodium chloride.
6. Sodium sulphate.
7. Calcium sulphate.

The occurrence of alkali salts in soils correlates quite closely with this order.

Whatever has been the cause of development of differences between plants in their response to the environment, it is the duty of the investigator to determine, if possible, the present characteristics which enable them to survive and flourish. It has been found that couch grass is able to withstand large quantities of black alkali. The researches of Mr. Benjamin of Hawkesbury College in New South Wales indicate that this is due to the presence of a substance known as suberin in the roots. It is suggested that the suberin protects the more delicate constituents of the tissues from decomposition by the powerful chemical in black alkali soils.

Plants adapted to conditions of high salinity usually exhibit a mechanism to lower the rate of transpiration or loss of water through the leaves. Everyone is familiar with the thick, grey leaves of plants growing in salty patches. Workers in the desert laboratories of the Carnegie Institute at Tucson, Arizona, have found that some plants of arid regions possess a substance which limits evaporation of water. This substance may be extracted from the leaves and is just as effective in hindering evaporation from cubes of gelatine as from leaves. Extension of researches along these lines, no doubt will lead to discoveries valuable from both the scientific and practical point of view.

Treatment of Alkali Soils.—Where abundant irrigation water is available and the land is valuable, soils affected with alkali may be reclaimed by treatment with such amendments as gypsum, sulphur or sulphur and lime and ferrous sulphate, and then thorough leaching. At the same time provision must be made for adequate and permanent drainage. Where irrigation is not possible the cultivation of alkali resistant crops may be attempted. One of the salt bushes, *Atriplex semibaccata*, has proved valuable in California, Arizona and New Mexico. It may be used for pasturage or cut for hay, and is reported to yield several tons of hay per acre under suitable conditions.

Sorghum may be grown successfully where the land remains fairly moist during the warmer months.

Small patches have been improved by scraping the surface few inches of soil. In any case steps must be taken to cope with a high water table, which is usually the trouble. Under some conditions drains about four feet deep should be constructed in order to carry off the surplus water, and with it the excess of soluble matter.

(*To be continued.*)

HORTICULTURAL NOTES.

Geo. W. Wickens,
Superintendent of Horticulture.

SEASONAL WORK FOR JANUARY, FEBRUARY AND MARCH.

January.

Fruit harvesting is the main occupation of fruit-growers at this time of the year, and to a great extent the quality and quantity of the product will be governed by the thoroughness with which the routine work of the past winter and early spring has been performed. Pruning, spraying, fertilising, ploughing, cultivating, hoeing, thinning of surplus fruits must all have received due attention at the proper time if the resultant crop is to achieve that degree of perfection which should be the standard aimed at by every genuine orchardist. The time has gone when haphazard methods were good enough: competition is now keen, and there is a steady increase in the quantity produced with a corresponding accentuation of the marketing problem. But it is noticeable and noteworthy that a glut of really prime fruit hardly ever occurs in this State, and when it does it lasts only for a very short period. Anyone, however, who visits the wholesale markets cannot fail to be impressed with the fact that at a great majority of the sales there is always too large a proportion of low grade stuff. This does not refer to very inferior fruit, which should not be cased up and offered for sale, but to second, third and fourth rate lines which, in many instances, could have been made into a first if the trees and soil had received the required treatment. However, if the attention needed has not been given, and the fruit now ready for marketing is not of the quality it should, and could be, growers so situated may enhance its attractiveness by careful selection, grading and packing. If all the fruit in a case is as nearly as possible of one size and quality, much better prices will be obtained than where the best and worst, and large and small, are placed all together in what may be described as the "jumble pack."

Apart from harvesting operations, soil cultivation and pest control are the main duties now requiring attention.

Every precaution should be taken by all growers in districts infested with fruit fly to keep the pest under control. All fallen fruit should be gathered up, not once or twice a week, but once in every 24 hours, and all fruits found to be infected should be boiled. If this is regularly done ,and foliage baiting and trapping also systematically attended to, losses from this pest can be kept down to small proportions. If no precautions are taken the effect is disastrous, both to the grower concerned and also to his neighbours.

Opportunity is again taken in these notes to remind apple and pear growers that Codlin Moth was present last season in two districts in the State—Collie and Narrogin—and though excellent results were obtained in the war waged against it, the fact must be borne in mind that just as it gained entrance there so it may to any other fruit-growing portion of the State, and every grower should carefully note any suspicious tunnellings in his fruits, and notify the Department at once. Its presence in fallen apples or pears will be easily detected this month, and it is only by the whole-hearted co-operation of growers and officers of the Department, such as has obtained in past outbreaks, that the pest can be subdued.

The apple crop this season promises to be a heavy one. If sufficient cases for holding same have not been ordered, growers should immediately arrange for further supplies.

February.

Gathering and marketing stone fruits and the early varieties of apples and pears, soil cultivation, and measures necessary for the control of insect pests are the major items claiming orchardists' attention during this month.

Some pears and grapes will probably be exported before the end of the month, but immature apples must on no account be sent forward for shipment.

This month and next are the worst periods of the year for Fruit Fly, and constant attention is needed to keep the pest under control.

March.

More fruit is exported from Western Australia this month than during any other month of the year, and with a heavy crop of apples a record may be established this season. Every care should be taken by all exporters so that the good name for quality and appearance which "the apples in the red boxes" have gained in the United Kingdom and European markets may be fully sustained. To attain this, every grower should grade uniformly, reject drastically, pack honestly, and stencil or label neatly and correctly.

In pest control give Fruit Fly neither rest nor peace, and closely watch for traces of Codlin Moth.

The Librarian of the University of Western Australia is anxious to obtain Nos. 10, 11 and 12 of Volume 18, 1909, of the "Journal of Agriculture" in order that their set may be completed.

It is probable that one of the readers of this "Journal," who is in possession of the numbers mentioned, may no longer require them and, if so, the Librarian at the University will be very pleased to receive the copies as a donation.

DAIRY FARM COMPETITION IN HARVEY DISTRICT, 1928.

G. K. BARON-HAY, B.Sc. (Agric.),
Assistant Superintendent of Dairying.

The Harvey Agricultural Society is to be congratulated on its move in opening a section in the Show Schedule for the best kept Dairy Farm, which action was made possible by the generosity of Messrs. C. L. Clarke, Burekup, and J. Lowe, Harvey, who made liberal donations for first and second prizes respectively.

Such competitions have been in existence for some years in other parts of the State, and have been productive not only of keen and friendly rivalry between resident farmers, but have been the means of making public the systems of farming being practised by the leading settlers in those districts, and which are best calculated to give the most remunerative returns.

The following conditions were laid down by the Agricultural Society, and accepted by the donors of the prizes, for the guidance of the judge, who was required to visit competitors during October for the purpose of judging their properties, without previous notice having been given.

1. All members of the Harvey Agricultural Society shall be eligible to compete, and that for the first year the competition be limited to members.

2. Points to be awarded as follows:—

	Maximum.
Farm Stock (preference being given to dairy stock of the Zone type)	50
Pastures	40
Supplementary Fodder Crops	30
Conservation of Fodder	30
Farm Buildings, Fencing and general layout	35
Farm Implements and Dairy Utensils	15
Total	200

3. With the view of permitting a farmer who has been but a short time on his property to compete with one who has been established many years, points to be added on the following basis:—

3	years	from virgin	country—	add 28	per cent.	of marks.
4	,,	,,	,,	add 24	,,	,,
5	,,	,,	,,	add 20	,,	,,
6	,,	,,	,,	add 16	,,	,,
7	,,	,,	,,	add 12	,,	,,
8	,,	,,	,,	add 8	,,	,,
9	,,	,,	,,	add 4	,,	,,
10	years or over —Nil.					

Prizes: First £10, donated by C. L. Clarke, Esq., Burekup. Second £5, donated by J. Lowe, Esq., Harvey. Third £2.

No less than eleven entries were received, which was most creditable for the initial effort, and the farms were situated in an area from Cookernup in the North to six miles West of Brunswick in the South, a distance of approximately 25 miles.

It was inevitable that over such a large area of the South-West, where farms are relatively small, and which embraces an irrigation area, that many different systems of farming should be encountered, depending primarily on the character of the land and the available water supply for the growth of summer fodder.

There were two main types of farms:—

(a) Irrigable,

(b) Non-irrigable.

Three farms were situated in the Harvey Irrigation Area, while two other competitors had private irrigating schemes.

Crop of peas grown by Mr. R. A. Clifton, Brunswick. More use might be made of this crop. Valuable for fodder or for grain.

These two widely different classes of farms necessitated the exercise of considerable discretion in judging, especially when dealing with the sections headed Pasture, Supplementary Fodder Crops, and Conservation of Fodder.

The guiding principle when dealing with these sections was to determine whether the dairy farmer produced enough suitable fodder on the farm for the maintenance of the *cattle in milk* during the year, whether this fodder be in the form of irrigated pasture, conserved hay, silage, etc.

The following is the list of dairy farmers who entered for the competition, and in Table 1 will be found the points gained by each competitor in the various sections:—

	Area of Farm. acres.
Mr. Stanley Bowers, "Westham," Brunswick	200 (Non-irrigable)
Mr. R. A, Clifton, " Innesfree," Brunswick	300 (17 acres irrigable)
Mr. A. S. Warburton, " Dalkeith," Brunswick	179 (Non-irrigable)
Mrs. C. Settor, " Hainault," Wokalup	129 (do.)
Mr. W. E. White, Wokalup	167 (do.)
Miss C. T. Heppingstone, " Rannock," Harvey	30 (Irrigable)
Mr. L. Prince, " Roma," Harvey	60 (do.)
Mr. J. Allen, " Naranjal," Harvey	20 (do.)
Mr. A. E. Rodway, " Eden," Cookernup	78 (Non-Irrigable)
Mrs. C. M. Corker, " Woodside," Cookernup	100 (do.)
Mr. G. H. Clifton, " Woorrarra," Cookernup	80 (Portion irrigable)

TABLE 1

——	Stock 50.	Pastures 40.	Supplementary Fodder Crops. 30.	Conservation of Fodder. 30.	Buildings, Fences, Lay-out. 35.	Implements Dairy Utensils 15.	Total Points. 200.	Add Handicap Points.	Final corrected Totals.
Miss L. C. Heppingstone, Harvey	46	40	57 (Irrigable)		33	15	191	. .	191
Mrs. C. Settor Wokalup	48	37	25	30	32	15	187	. .	187
Mr. W. E. White Wokalup	46	40	20	30	27	14	177	7 08	184 08
Mr. G. H Clifton Cookernup	45	33	26 (Part Irrigated)	27	25	13	169	13 52	182 52
Mr. R. A Clifton Brunswick	45	34	28 (Part Irrigated)	28	20	11	166	13·28	179 28
Mr. S Bowers, Brunswick	43	35	30	25	20	11	164	13 12	177 12
Mr A. S. Warburton Brunswick	40	36	30	26	15	10	157	18 84	175·84
Mrs. C M Corker Cookernup	44	35	30	26	19	11	165		165
Mr. L Prince, Harvey	42	37	53 (Irrigable)		20	10	162	..	162
Mr. A. E. Rodway Cookernup	25	33	30	25	20	10	143	17 16	160·16
Mr. J Allen Harvey	35	35	50 (Irrigable)		25	11	156	.	156

DAIRY STOCK.

With one exception the whole of the herds of milch cattle inspected were in first class condition, and were receiving little, and in most cases no hand-feeding at milking times.

This alone is an indication of the rapid strides made in pasture production in these districts, and is in marked contrast to conditions which were commonly encountered as recently as four years ago.

The average yields of the herds were remarkably good, especially those of the three placed farms and those of Mr. S. Bower's herd, as is shown in Table 2.

TABLE 2.

Name.	Cows in milk.	Total cows excluding 2 year old Heifers.	Total Milk Production.	Average Milk Yield per cow.	Remarks.
			Galls. per day.	Galls.	
Miss Heppingstone ...	20	26	70	3·5	Pasture only.
Mrs. C. Settor ...	16	19	49	3·1	Little chaff.
W. E. White ...	17	20	64	3·7	Pasture only.
G. H. Clifton ...	9	15	18	2·0	Calves in summer.
R. A. Clifton ...	16	16	36	2 25	Pasture only.
S. Bowers	24	26	70	2·9	do. do.
A. S. Warburton ...	25	26	61	2·4	do. do.
Mrs. C. M. Corker ...	24	28	48	2·0	do. do.
L. Prince	16	21	36	2·25	do. do.
J. Allen	5	6	14	2·8	do. do.
Averages	17·2	20·3	46·6	2·69	

Table 2 gives some idea of what may be expected from a herd of 17 cows fed on good pasture only, and where the milk is separated on the farm, the butter fat being sent to a factory and the skim milk fed to pigs or calves.

With butter fat valued at 1s. 8d. per lb. and skim milk valued at 2d. per gallon, an average herd comprised of 17 cows similar to the above, with milk testing only 4 per cent. butter fat, would return £53 5s. 6d. per month from the sale of butter fat and skim milk. The nett profit of course would depend to a great extent on the cost of producing feed for the stock, the cheapest of which is undoubtedly pasture.

"ZONE" BREEDING.

The Harvey Agricultural Society has loyally supported the policy of the Superintendent of Dairying (Mr. P. G. Hampshire) for the "Zone" breeding of dairy cattle, and the wisdom of this policy is now being realised by the society, whose annual show is already regarded as the leading show for milking Shorthorn cattle outside the Perth Royal Show, in which zone Harvey lies.

It was most gratifying to find that this policy is apparently being adhered to by farmers also, as practically all the competitors were either grading up now with pure bred bulls of their "Zone" breed or were in the process of doing so, as is shown in Table 3.

TABLE 3,—ILLUSTRATING EXTENT OF "ZONE BREEDING."

Name.	Breed of Herd.	Zone Breed.	Herd Sire.	Remarks.
Miss Heppingstone	Mixed ...	M.S.	Friesian, *ex* tested dam	Sold, and M.S. purchased.
Mrs. Settor ...	M.S. ...	M.S.	Pure bred M.S.	
W. E. White ...	Ayrshire ...	M.S.	Pure bred A. ...	Considering purchase of M.S.
G. H. Clifton ...	M.S ...	M.S.	M.S. *ex* tested dam	
R. A. Clifton ...	Jersey ...	J.	J. *ex* tested dam	
S. Bowers ...	Jersey ...	J.	J. *ex* tested dam	
A. S. Warburton ...	Mixed ...	M.S.	M.S. *ex* tested dam	
Mrs. Corker ...	Jersey ...	M.S	Pure bred J.	
A. E. Rodway ...	J. & M.S. ...	M.S.	M.S.	
J. Allen	M.S. ...	M.S.	*Nil*	
L. Prince	M.S. & J. ...	M.S.	M.S. *ex* tested dam	

M.S = Milking Shorthorn. J. = Jersey.

Grade Milking Shorthorn Heifer, result of the continued use of pure bred bulls. Mrs. C. Settor, Wokalup, has a high grade milking shorthorn herd.

It will thus be seen that of the eleven competitors one did not own a bull, while no less than seven were grading up with bulls of the zone type, two were negotiating for zone type bulls at the time of inspection, and only one competitor was definitely breeding outside the zone type.

Mrs. Settor's herd of milking Shorthorn cows at Wokalup is a fine example of the value of continuity in breeding to one type of cattle, as is also Mr. G. H. Clifton's herd of milking Shorthorns at Cookernup. Mr. Clifton purchased a pure bred bull ex a tested cow only four years ago, and already has a fine herd of grade milking Shorthorn cattle.

In the Jersey zone Mr. R. A. Clifton's herd at Brunswick stands out, closely followed by that of Mr. S. Bowers, who have always had only pure bred Jersey bulls on their properties.

The principle of changing the breed of the bull from time to time is wrong, and evidently dairy farmers are realising the necessity of some fixed type in breeding if the *productions* of their herds are to be improved.

THE REARING OF YOUNG STOCK.

As will be seen above, the size of the farms in the competition varied from 20-300 acres, the smaller farms being typical of those in the Harvey Irrigation Area.

The great problem of dairy farmers on these small areas is how to economically rear young stock to repair the wastage in their herds, and at the same time improve the quality of their herds.

On a small farm of, say, 30 acres, and which is usually highly capitalised, it is not economical to rear young stock, which are not reproductive for at least two years. The whole of such a farm is required to produce fodder for the milking herd alone, which should be kept in milk all the year round in order to meet high interest charges and irrigation water rates.

Several cases have come under the writer's notice where farmers have had to sell their heifer calves, or are only able to keep one or two from the better cows, owing to not having sufficient cheap grazing on which to pasture them.

It would seem essential therefore that on these small areas some other run or paddock should be available for the rearing of heifers and running dry stock.

Many settlers have such blocks, either on the coast or in the hills, the latter being preferable: which enables them to milk larger herds on their farms than would otherwise be the case.

The Government, recognising the necessity of some such run for the use of dairy farmers in the Harvey Irrigation Area, have set aside an excellent strip of hill country of approximately 1,200 acres, which adjoins the town boundary.

Unfortunately this area has not been developed to any extent, and does not, in its present state, carry suitable feed for young growing stock or for milch cows carrying a calf.

PIGS ON THE DAIRY FARM.

No less than four depots handling whole milk, which is freighted to the metropolitan areas, serve the district affected by the competition, *i.e.*, one at Brunswick, two at Harvey, and one at Yarloop.

This demand for whole milk has had the effect of causing dairy farmers supplying these depots to drop the rearing of pigs, and in some cases neglecting to properly rear their heifer calves.

Only one competitior, Mr. W. E. White, at Wokalup, had developed the rearing of pigs to any extent, and had built comfortable and sanitary sties. The accommodation in all other cases for pigs was far from satisfactory, the chief fault being bad drainage leading to wet insanitary conditions. As pigs are very liable to pneumonia this no doubt accounts for heavy losses and unsatisfactory returns experienced by many farmers in the South-West, especially during the wet months.

Mr. W. E. White, Wokalup, grazes breeding sows whenever possible.

Mr. White runs nine sows and aims at marketing at least 150 porkers or baconers, some of which are bought and fattened, each year. These sows cost very little to maintain, as they are allowed only grazing until near farrowing and when suckling the litter. Mr. White has shown that by maintaining a good herd of cows, separating the milk, and feeding the skim milk to pigs, the income from the herd can be at least doubled, which return compares very favourably with that of farmers supplying whole milk to a depot, and is a more stable market.

PASTURES.

Taking the entries as a whole the pastures were good, but varied a great deal in the character of the herbage which composed it.

On every farm where irrigation was not possible, subterranean clover formed the foundation of the pasture. With the advent of top dressing some five year's ago, the response of this clover to phosphatic fertilisers made it apparent that this clover was going to mean untold wealth to the farmers of the South-West, and has been the means of putting many farmers in this district on their feet.

The practice of purchasing burr seed, however, is still very prevalent, and is not at all to be recommended. There is no better means of spreading weeds and diseases than by sowing subterranean clover in the burr obtained from farms with these pests.

The commonest weeds encountered were dock and two varieties of bartsia, one having a red flower and the other a yellow flower, this latter being particularly common round Harvey, and the writer has direct evidence that the pest is spread very quickly through the use of subterranean clover seed in the burr.

Another serious pest is dodder (*Cuscuta sp.*), and there is abundant proof that this is carried by "burr" seed. It is also suspected that the remarkably rapid spread of lucerne flea and the red legged earth mite in the South-West has been due to the almost universal practice several years ago of using clover seed in the "burr."

Second year's Subterranean Clover pasture, following crop of potatoes.
S. Bowers, Brunswick.

The writer strongly advocates the purchase of clean seed. Subterranean clover, however, being an annual does not provide green feed in the summer and it is necessary for farmers relying only on this clover for pasture, to grow green fodder in the summer for the milking stock.

On farms that can be irrigated, however, this is not the case, as the pastures may be kept green all the year round. Very fine permanent pastures were seen on Mr. Prince's farm at Harvey, and also on Miss Heppingstone's farm, the latter being the finest pasture of a permanent nature yet seen by the writer.

On both these farms paspalum dilitatum with white dutch and subterranean clover form the base, the two former remaining green all the year round. In these cases it is not necessary to grow green crops in the summer. This mixture appears to give excellent results on the clay soils forming the irrigation area at Harvey.

The topdressing of pastures is universal, all farmers practising the system, the general application being 1 cwt., though some competitors put on double this dressing at the one application. The writer believes that 1 cwt. per acre is the most economical dressing to put on for pasture, and should be applied early in the autumn.

On irrigation areas, however, it is profitable to always apply two dressings. The owner of the winning farm is particularly liberal in manure, putting on two hundredweight of superphosphate in early autumn, followed in September with 1 cwt. of potato manure. Probably the second application of a manure containing some nitrogen is a wise practice, as this would have the effect of specially stimulating the grasses while the phosphatic portion of the manure would stimulate the clovers. It is believed that 1 cwt. of superphosphate in autumn followed by 1 cwt. in the spring, and the use of the harrows to break up the dung, would be found most economical.

A herd of 24-26 milking cows is maintained on the 30 acres of the winning farm and 10 acres on an adjoining farm, which is a very high carrying capacity indeed. This farm is also remarkable for the paucity of the weeds found in the pasture.

Miss C. Heppingstone's herd on Paspalum and White Dutch Clover pastures, Harvey.

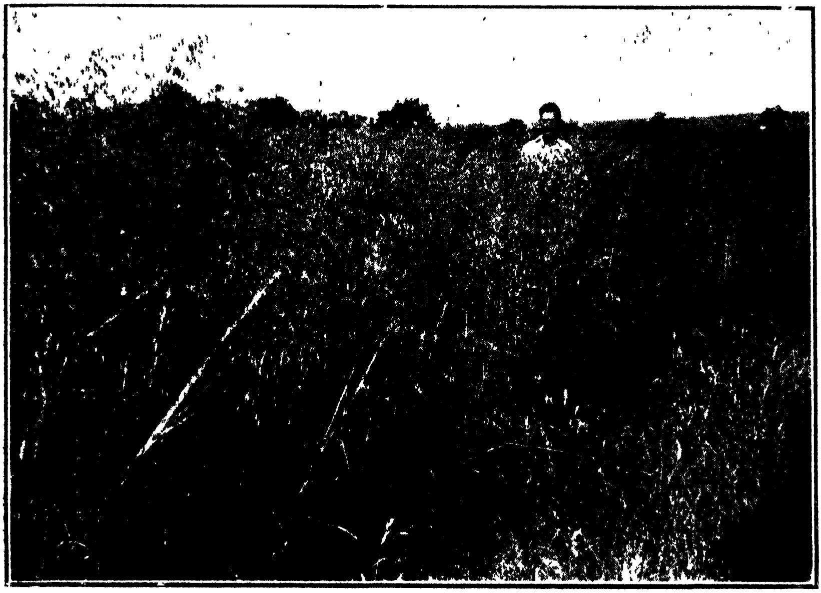
SUPPLEMENTARY FODDER CROPS AND CONSERVATION OF FODDER.

The farms gaining first and second places exemplify very clearly the two systems of farming which are necessary to maintain cows in milk throughout the year.

The first farm, that of Miss Heppingstone, an irrigation farm, relies almost solely on green permanent pasture, the second type must conserve large quantities of hay, and grow some green summer crop for succulent feed.

The lean periods of the year vary also in each case, on irrigated areas the lean period being the early winter months, from May to early August, when little growth takes place. On the larger well drained farms, where the soils are dry at the beginning of the winter, growth takes place more rapidly than on irrigated farms, where the soils are often waterlogged at the commencement of the rains, due to over use of the available water. On non-irrigable farms in this district the lean period for dairy cattle is rather longer, from January to June, during which time resource must be made to grown fodder crops and the hand-feeding of bran and hay.

On these farms it is believed that provision should be made for one ton of hay, preferably meadow hay, for every cow unit, the term "cow unit" including not only the cow but the attendant young stock also. For the cows in milk, at least one acre for every cow was looked for, as is recommended by Mr. P. G. Hampshire, the Superintendent of Dairying, in Bulletin 216, "Summer Crop Competitions."



Oats for hay, grown by Mrs. C. M. Settor, Wokalup. Variety: Algerian.

In practise with an average crop of maize of 10 tons per acre, this area of fodder fed in conjunction with hay, preferably meadow hay, will comfortably tide the herd over the lean period till the end of July.

On irrigated farms the conservation of fodder in the form of hay is not so essential, and on very small areas almost impossible. Some reserves however, are preferred, and the winning competitor, though on a small irrigated farm, intended to cut 9 acres for meadow hay.

The tonnage of hay intended to be cut for summer and early winter feeding was generally satisfactory, but several competitors outside the irrigation farms did not grow the quantity of green fodder for feeding in the summer months considered necessary.

SMALL PADDOCKS.

The necessity of small paddocks for the economical feeding of pasture was very evident, as in every case where the carrying capacity was high, the farm was divided into numerous and small paddocks.

The winning farm of 30 acres is divided into no less than nine paddocks, which allows for rapid and frequent feeding off. Mrs. C. Settor, the second prize winner, has her farm of 129 acres divided into 16 paddocks, while Mr. White, who secured third prize, with 167 acres, 80 of which is hill country, has 17 paddocks, and the same principle was demonstrated by other competitors.

SHELTER FOR STOCK

Shelter for milking stock is essential during the cold winter months, and to protect cattle from the heat of the sun during summer, and is a matter that has apparently received little attention when clearing many properties originally. This applies particularly to the smaller farms lying to the West of the South-West railway line. Due attention has been paid to this important item by the three placed farmers, the prize winner in particular having gone to some considerable trouble to ensure proper shelter for her stock.

BUILDINGS.

In judging the farm buildings the following points were considered:—

(a) Suitability for the purpose for which intended.

(b) Lay-out for economical working and possible further extension.

(c) Cleanliness.

Milk sheds were required to be floored with concrete, well drained and clean, and to have suitable arrangements for handling milk or cream, and for the washing of utensils.

One of the facts that must be considered when determining whether it will be profitable to enlarge a dairy herd, beyond that capable of being handled by the farmer and his family, is the question of employing outside labour. By the use of milking machines it has been amply demonstrated in this district, that where cleanliness is observed, the herd may be easily enlarged to the carrying capacity of the farm without the need of further labour being employed for milking.

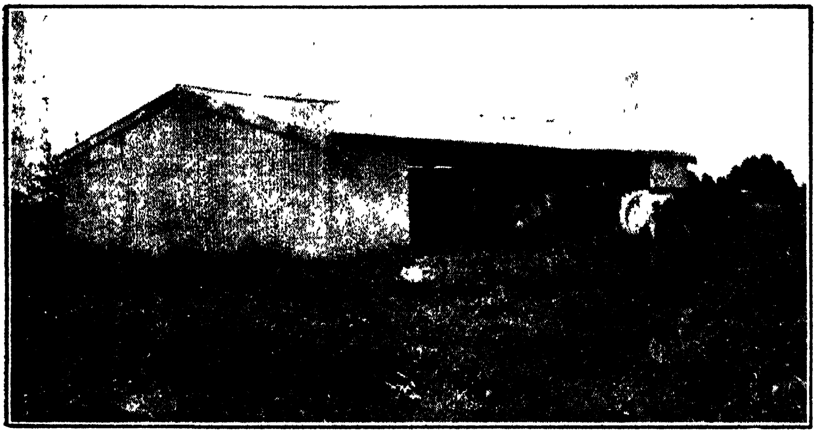
This being so it was considered necessary that the milking shed should be so designed as to facilitate the installation of milking machinery if found desirable.

This was a failing point with the second prize farm, where milking is carried out in three separate series of stalls, built on the loose box principle; the third prize winner has not yet erected a milking shed with a concrete floor, but hopes to do so in the near future.

GENERAL REMARKS.

The writer could not but be struck by the fact that the leading farmers in the district now realise that the dairy industry does not mean the milking of cows only, but embraces such other legitimate industries as pig and poultry raising and potato growing.

No longer does the dairy farmer who, owing to his geographical position, is unable to supply whole milk to a depot, complain that the supply of butter fat to a factory does not constitute a living, as by the combination of one or more of the above avenues of revenue, the difference in price between his product sold as whole milk and that obtained when sold on a butter-fat basis is more than compensated for. This was shown by the results obtained in the competition, though numerous other instances could be cited by Messrs. White at Wokalup and S. Bowers at Brunswick, both of whom supply cream to a factory and feed the skim milk to pigs.



A shelter shed erected by Miss C. Heppingstone, Harvey. This property is exceptionally well sheltered.

The competition has made evident, what the writer has noticed for some months, that the farmers of this district are now optimistic of the future, and have a justifiable faith in the suitability of their district for the dairying industry in its widest sense.

The writer would like to thank competitors for the ready manner in which all the information desired was given, though in many cases of an intimate nature, and which assisted materially in carrying out the duties of judge.

CLIMBING CUT-WORM OR TOMATO MOTH.

(*Chlorodea obsoleta.*)

L. J. NEWMAN,
Entomologist.

During the past spring caterpillars of various kinds have been unusually prevalent. In some instances they have been so numerous as to constitute a plague.

The caterpillar most in evidence was the larva of the Climbing Cut-worm or Tomato Moth.

All kinds of cultivated plants and weeds are used as food hosts by this moth.

This insect is of no new occurrence here, being recorded as a pest in the State for the past 30 years, and was probably present before being officially recorded. It is an introduced insect and attacks many kinds of garden plants and weeds. This very general dietary amongst plants and its very rapid reproduction powers, render its subjugation or control exceedingly difficult.

Description of Adult.—It is a stout bodied moth, measuring about ¾ inch in body length, with a wing spread of about 1½ inches.

The front pair of wings are usually of a drab colour with indistinct brown markings. The hind pair are whitish in the main, the hind edges being black.

When at rest the front wings almost conceal the hind ones. This moth has a peculiar habit of vibrating its wings very rapidly when disturbed.

It belongs to the group of night flying insects, known as the Noctuidae, remaining in concealment during the day. They may be disturbed during the day and will fly off with a rapid, low, irregular movement, quickly settling and hiding again. They may also be seen in action during very dull days.

The moths feed upon the nectar of flowers or other available surface moisture.

Each female is capable of laying up to 1,000 eggs and will continue ovipositing over a period of about 16 days.

The eggs are tiny whitish objects, about the size of a pin head, and are usually laid singly upon the foliage. They hatch in from three to six days, according to the weather conditions.

The caterpillars, when first hatched, are tiny blackish objects, and have a decided preference for fruits and the nectary glands of flowers, which they bore into and spoil. A single caterpillar will pass from fruit to fruit or from pod to pod and thus do very considerable damage. Every fruit so injured is "done for," so to speak, because it quickly becomes rotten and unfit for marketing.

The larvae go through several moults during their life of 18 to 20 days. After each casting of the skin, which takes place six times, they appear with different body markings. All sorts of coloured caterpillars may be observed in a crop, but it will be found that most of them are of the same parent moth.

There is another caterpillar frequently found about the same time, namely the Green Potato Looper (*Plusia argentifera*). This caterpillar is readily distinguished by the fact that it loops the body when crawling along, and is green.

When full grown, the Climbing Cut-worm measures from 1¼ to 1½ inches in length. The body is generally marked longitudinally with light and dark lines, covered with black spots, from which soft hairs spring.

To pupate, the full grown caterpillars descend to the ground and there bury themselves to a depth of 3 to 4 inches. A chamber is formed in the soil and therein pupation takes place. Here in its earthen cell, it changes into a moth. This change may take place in two weeks or if weather and temperature are unfavourable, it may take months. When, however, the full period is reached, the moths issue from the pupae in the soil and are in a day or two ready to propagate their species.

The pupa is about ½ inch long, brown and oblong, and is found in the soil.

There are several generations of this moth during the year. The generation of greatest economic importance is, however, the spring one. This makes its appearance in the Geraldton district about mid-August or early September. In the more southern areas, it is October, and in the extreme south November.

As the summer and consequent dry conditions become established, the pest dies down. This is due to the drying up of the cape weed and other plants, which in their green state are relished by the caterpillars. It is when these weeds dry up that the caterpillars swarm on to the cultivated green crops.

Measures of control—Prevention.

Clean Cultivation.—The importance which the suppression of weeds and clean and careful methods of farming generally bear to the control of insect pests is usually underestimated, if indeed it is realised at all.

The term weed is usually applied to any plant which is neither useful nor ornamental, but from a farmer's or gardener's point of view, any plant which is out of its proper place is equally a weed.

The entire area to be planted to a crop should be kept free of weeds and rubbish and under clean fallow for as long a period as possible before crop is grown. If land has been allowed to become full of weeds and rubbish prior to turning in and planting, many eggs, larvae and pupae will be present in the soil. As a matter of fact, many of our insect troubles are largely the fault of insanitary farming methods. It is no uncommon thing to see old useless plants left growing and the headlands and fence alignments covered with a gross growth of weeds and rubbish. Under such conditions, it is impossible to cope with insect pests.

It is useless destroying the insect in the crop if we offer them an attractive home and breeding grounds upon the headlands and fence alignments.

Volunteer plants of any crop which grow outside the actual planted area should be destroyed, unless subjected to treatment. Many weeds and crops, such as cape weed, peas, lupins, maize, young fruits and garden plants, are attacked, but the crop which suffers the greatest economic loss in the South-Western areas is the tomato.

It is, therefore, more particularly to the control of this pest on the tomato that the balance of this article deals.

Having prepared the land and planted the tomato in the manner suggested, the next preventive measure is to see that the plants are properly trained. Under the old system of allowing the plants to spread over the ground, there are many disadvantages. Tillage of the soil is impossible, picking of the fruit is laborious, fruits are seriously sunburnt, and the successful application of insecticides is rendered difficult, if not impossible.

Trellising or Staking.—To overcome these difficulties, it is necessary to trellis or stake the plants. The advantages of these methods over the old sprawling system are the following:—

The vines can be sprayed or dusted for insect or fungoid troubles.
The land can be cultivated and kept free of weeds.
Better quality fruit can be produced and just as early.
More plants per acre can be grown.
Picking and treatment are rendered easier.
Sunburn is largely prevented.

Picking and destroying all infested fruits.

Wormy tomatoes (being already rendered useless) should be gathered and destroyed. This will largely prevent sound fruits being visited by caterpillars from injured fruits. It will also destroy those caterpillars that otherwise would leave the fruits and enter the soil to pupate and give birth to further moths, whose progeny would intensify the trouble.

Tomato plants when finished with should be pulled up and destroyed by fire, together with all other rubbish on the ground, with as little delay as possible.

Land which has been under tomatoes or other susceptible crop should be ploughed as soon after as possible. Ploughing crushes numbers of insects which are in the soil and exposes others to the attacks of their natural enemies and the elements.

It is not suggested that, if the above preventive measures are carried out, an entire freedom from insect pests will be obtained. There is no doubt, however, but that clean and careful methods of cultivation result in a diminished number of those insects which reduce annually the yields obtained from the land.

Remedial Treatment.

Trap Crops.—The maize plant is a favourite host food of this moth. It is especially serviceable in luring the early spring brood. Its value as a trap entirely depends, however, on its being taken out and used as a fodder or otherwise disposed of as soon as the silking stage of the cob has been reached. If left, of course, it will only furnish a further crop of moths.

The maize should be grown in rows here and there throughout the tomato crop.

Spraying or Dusting.—It is not necessary to use any insecticide before the first of August, provided the land planted has been kept under clean fallow.

The first moths in the northern district would not appear before August, October in the mid-south-west and November in the south. These deposit their eggs upon the foliage. The young caterpillars, when hatched, feed here and there for two or three days before boring into any part of the stem or young fruits. It is, therefore, advisable, that arsenical sprays or dusts be applied to the foliage and green fruits.

As a routine treatment of tomatoes and potatoes this Department has persistently advised the application of Bordeaux or Burgundy mixtures as fungicides. If paste arsenate of lead is combined with this fungicide, at the rate of 1 lb. or ½ lb. of powdered arsenate of lead to every 16 gallons of the bluestone mixture, an effective combined fungicide and insecticide will be provided.

This should be applied at intervals of, say, 10 days, until within three weeks of the fruits becoming ripe.

These sprays can be obtained in ready to use form.

In combining the arsenate of lead with the bluestone mixtures same must be kept agitated and used as soon as mixed. Arsenate of lead and molasses make a good spray. Formula—2½ lbs. paste arsenate of lead, 3 lbs. molasses, water 50 gallons.

There are a number of proprietary dusting powders on the market containing arsenate of lead, bluestone, and sulphur combined, which should be very useful.

Note.—No poison sprays or dusts should be applied to fruit after it has started to colour. If, however, the early broods of the pest are destroyed, there should be little to fear from the Climbing Cut-worm when the ripening period is reached.

As a general bait for ground cut-worms, the following mixture is excellent:—

Bran 30 lbs., arsenate of soda or paris green 1 lb., molasses or treacle 4 lbs., water to mix to the consistency of a crumbling mash.

The bait should be distributed towards evening along the rows of plants attacked. The cut-worms come out at night and feed upon this bait and are destroyed thereby.

In conclusion, it must be again emphasised that farm sanitation coupled with well prepared land, proper cultural methods, staking or trellising of the plants, are the chief factors in the control of this pest.

The use of the sprays or dustings are supplementary.

Another very essential factor is that all growers co-operate in the fight. One neglectful grower may be the means of undoing the good work of all the others in the district.

THE EXPORT TRADE IN APPLES AND PEARS AND REGULATIONS GOVERNING SAME.

Geo. W. Wickens,
Superintendent of Horticulture.

At the time of writing—25th November, 1928—there is every indication that the apple crop in Western Australia for the Centenary Year, 1929, will constitute a record for the State. Practically every variety has set heavily, even such in-and-out performers as "Rome Beauty" and "Nickajack" give promise of an abundant harvest, while "Dunn's" appears to have forgotten its usual alternate year cropping habit in a general heavy yield. "Grannies," "Jonathans," "Yates," "Cleopatras," and "Dougherties" have all set heavily, and so have the many other sorts which are planted less extensively than those named. Of course, many things may happen between now and the time when the fruit has reached maturity, but if nothing unforeseen and unexpected occurs Western Australian apple production in the State Centenary Year will exceed the 1,000,000-bushel mark. The highest previous yield occurred in 1927 (with 901,464 bushels), and this was followed in 1928 with 409,058 bushels, the lowest since 1921. Unfortunately, a light crop of apples does not mean high quality fruit: in fact the reverse nearly always happens: over-sized specimens, soft and liable to early decay being common in the light year. These characteristics were particularly noticeable in the 1928 crop, and it was fortunate our shipments overseas in that year comprised the comparatively small total of 169,273 bushels for much of the fruit, though of fairly good appearance at time of export, did not have the texture and keeping qualities which buyers have learned to expect in apples forwarded from Western Australia.

In spite of last season's experience it is pleasing to know that buyers are again in the field this season purchasing heavily at very satisfactory prices for shipment to European markets, and in connection with this it behoves all growers to remember that heavy crops have disabilities which, though different from those of light crops, are likely, unless guarded against, to prejudicially affect the production of high class fruit. If the trees are allowed to over-bear the fruit will be small, hard and lacking in juice, and if ever there was a season when *thinning* should be rigorously practised it is with us now, so that the name for high quality which Western Australian apples have made in the overseas markets, and which may have been somewhat tarnished last season, will be fully sustained in the State Centenary Year.

The Commonwealth Regulations governing the export of apples and pears are being tightened up, and instructions have been issued that action must be taken against any person who attempts to wilfully export such fruits as do not comply with the standards laid down.

Amendments to be brought into force in 1929, and suggested amendments for 1930 and 1931, with instructions issued regarding same are as follow:—

COMMERCE (GENERAL EXPORTS) REGULATIONS.

From 1st January, 1929—

The diameter of apples and pears is to be defined as the greatest transverse measurement of the fruit taken at right angles to the line joining the stem and the calyx.

Regulation 48 (c).—Normally small apples in the standard grade of the minimum diameter of two inches bearing any signs of black spot fungus will not be allowed exportation. The minimum diameter of pears in this grade is to be reduced from 2¼ to 2 inches.

Regulation 48 (d).—A further proviso to the plain grade is to be added to prevent exportation of apples of the minimum diameter of 2 inches bearing any signs of black spot fungus. The minimum diameter of pears previously omitted from this grade is to be 2 inches.

Regulation 61.—The whole of the trade description is to be applied to one end of the case. Provision is being made to enable either the size or number of apples or pears contained in each case to be included in the trade description. Apples or pears described as 3¼ inches in diameter will include fruit of 3¼ inches, but less than 3½ inches in diameter. A new size of 3½ inches diameter will include fruit of that size or any greater diameter.

From 1st January, 1930—

Regulation 47 (b) is to be amended to make it compulsory for the ends of cases to be smoothly dressed.

From 1st January, 1931—

Regulation 48 (d), which relates to the plain grade for apples and pears, is to be deleted from the regulations.

Regulation 61 is to be amended to provide for the inclusion in the trade description of the number of fruit contained in the case in place of the optional use of the size or number of fruit. (The inclusion in the trade description of the size or number will be optional during the 1929 and 1930 seasons).

The Regulations are to be further amended as from 1st January, 1931, to provide that the export of the following varieties of apples shall be prohibited:—Alexander, Allington Pippin, Crow's Egg, Golden Pippin, James Grieve, Mobb's Codling, Prince Alfred, Peasgoods Nonsuch, Winter Majetin, Hoover Pippin, Shockley, Trivett.

It is requested that early action be taken to notify growers and exporters in your State, either directly or through the local organisations and the Press, of the proposed amendments to the Regulations, and the dates on which such amendments will probably be brought into operation.

When notifying growers and exporters of the proposed amendments to Regulation 47 (b), which is to take effect as from the 1st January, 1930, and which provides for smoothly dressed ends of cases, it should be mentioned that the increasing practice of applying the trade description by means of paper labels makes it necessary that the surfaces of the ends of cases to which labels are applied should be smooth to enable the labels to adhere firmly to the wood.

Immature Fruit.

An announcement will be made in the Press early next year to the effect that immature fruit will not be allowed exportation. It is pointed out that inspectors should be instructed by the supervising officers to exercise the strictest supervision in order to detect immature fruit, particularly during the early shipments. All such fruit which, in the opinion of the inspector, is likely to arrive in the overseas market in a deteriorated condition should be rejected.

Rejection of Unsuitable Cases.

In view of the number of unsuitable cases submitted for export last season, the supervising officer should instruct inspectors to reject any cases made from unseasoned timber or which are unsightly, undersized, stained, warped or split to an extent which in the opinion of the inspector would be detrimental to Australia's overseas trade. Early action should be taken by the supervising officer to notify growers and exporters that such unsuitable cases will not be permitted exportation, special mention being made in regard to cases made from unseasoned timber.

. . . .

In order to prevent the exportation of fruit which has been prohibited exportation by proclamation, or which is not up to the standards prescribed in the regulations, or which has been misdescribed, badly packed or, generally speaking, is unfit for export, it is desired that a serious view be taken in all instances where the Regulations have been in any way contravened.

Contraventions of the Regulations are dealt with by the Collector of Customs under Part XV. of the Customs Act upon receipt of advice from the State Supervising Officers.

Unless there is strong suspicion of wilful intent on the part of the exporter to ship fruit below standard or misdescribe it in any way, no action, other than warning the firm or person concerned, should be taken in regard to the first offence for the season by any one exporter.

In regard to all subsequent offences (and in first offences also if there is suspicion of wilful intent to ship, etc., inferior fruit) the matter should be fully reported to the local Collector of Customs with a request that action under Part XV. of the Customs Act against the party concerned be taken.

SOME NOTES ON RABBIT DESTRUCTION.

C. J. CRAIG,

Chief Inspector of Rabbits.

Of all the agencies of destruction that rabbits have to contend with in the struggle to exist, and to increase, the operations of man are undoubtedly the most destructive. Their numbers are reduced by carnivorous animals, parasitic diseases, the droughts of summer and the floods of winter, but the use of strychnine, phosphorous, poisonous gases and other methods of destruction applied by man easily account for the greatest numbers. The general application of poison during the main poisoning season followed during the winter with the fumigator and more poison where necessary, are the essential factors whereby the pest can be satisfactorily suppressed. But how are we to secure their effectual application? Only by organisation, adequate and effectual supervision, an abundant supply of poison at a reasonable cost, a firm judiciary, and the removal of those conditions which tend to the conservation of the pest, and through which much of the best rural areas throughout the Commonwealth are being utilised to no more beneficial and legitimate purpose than feeding rabbits. Unless all these measures be applied rabbits are liable to increase, and one measure without the other is of little use. Numerous suggestions have been made from time to time with a view to amending the system of administrative control, but no matter what the system of control may be, or how powerful the mechanism of the Vermin Act, the degree to which rabbits are suppressed will mainly depend upon the cost and accessibility of poison and other essential materials, the methods employed, and the extent to which those responsible for their actual destruction are dominated by a sense of personal responsibility to their neighbours and the State, or by fear of loss to themselves in cash. Legislative precepts and the imposition of light penalties are in themselves insufficient to prevent neglect. Ever since rabbits became a pest—nearly 50 years ago—the best brains in the pastoral and farming communities have been centred on the problem of how best to combat the difficulty. It can only be done by work. The man who protects his property by wire-netting, poisons in summer, and fumigates and poisons in winter will not suffer serious loss. The Vermin Board's inspector, who conscientiously and earnestly advises settlers on these matters wherever it is necessary, will materially assist in solving the rabbit problem. The wonderful boom the rabbit skin market has had this winter is apt to upset some people's perspective of the pests' real position, more especially as a continual menace to our greatest national asset in the pastoral industry. Those who can review the cold facts are not blind to the reality that the enhanced value of the pelt is a great incentive to the destruction of the pest, but that to accept it as a reason for encouraging the breeding of rabbits would be to undermine legitimate industries of the land. As rabbits become more numerous, and, with an increase of the netted areas, the presence of the vermin is more keenly felt in the open spaces. Poisoning and fumigatory methods will undoubtedly keep them in check, but they are always moving and the work of the keeping them under is a continuous job. Netting the whole of the holdings must be undertaken sooner or later; in fact, a farmer cannot afford not to net. To fence a 1,000 acres farm requires about five miles of netting. This can be obtained from the Lands Department under the Commonwealth Assistance Scheme on very easy terms. The price is approximately £46 per mile or £230 for the 1,000 acres. Repayment is made on easy terms spread over 25 years. The annual payments, including sinking fund and interest on this amount, would be £16 2s., which is practically 7 per cent. on the total amount involved. If the farmer lost 15 acres of crop, with its possible yield of 13 bushels, the amount of 4s. per bushel would total £39, whereas the repayment on the netting (including sinking fund) is only £16 10s., thus an amount of £22 10s. per annum is saved. In addition the owner of a netted area has the following advantages:—

1. No local vermin rate to pay.
2. A valuable asset and less poisoning.
3. Better fence for all kinds of stock.
4. Increased carrying capacity.
5. No more killing a neighbour's rabbits.

I would, therefore, strongly recommend all Boards to urge settlers to take advantage of the opportunity afforded to obtain netting on such liberal terms.

SORREL.

(*Rumex acetosella Linn.*)

W. M. Carne, A. B. Adams, and C. A. Gardner.

Sorrel is a weed common in the moister parts of the South-West of this State. It is particularly common on the low-lying parts of the coastal plain. However, though most frequently found on soils which are wet in the winter and badly drained, sorrel is not necessarily confined to them. It is, indeed, not particular as to soils but owing to its ability to live on sour soils it can there thrive and spread with little competition from other plants. Under better conditions it may be held in check by the strong growth of other plants such as grasses and clovers. Heavy dressings of lime are frequently recommended in other countries, but are not economically possible in most parts of this State. The beneficial effect appears to depend more on the encouragement given to competing plants than to any deleterious effect on the sorrel itself. There is no doubt that sorrel will grow on soils which do not need lime and even on well-drained sands. With us the use of phosphatic fertilisers will attain the same end as heavy dressings (two tons and upward) of lime and more economically.

Like so many other weeds, sorrel owes its importance to its effective means of spreading, and to the difficulties of eradication. In addition to seeding freely it possesses creeping underground stems which root and send up surface shoots at intervals. If these underground stems or runners are broken or cut up in cultivation, each piece is capable of new growth and of developing into a plant, hence in some cases cultivation only tends to increase the spread of the weed by distributing the underground parts. Stock spread the plants by passing undigested seeds, and sorrel has been observed growing in proximity to old cattle pads almost immediately after the land has been first ploughed and fertilised, and also on ring-barked, uncultivated country after an application of superphosphate. Sorrel seeds are a common impurity in grass and the smaller clover seeds. They are also frequently found in samples of subterranean clover burr, but not in the cleaned seed of this species.

Although it is eaten by stock, sorrel cannot be regarded as a useful pasture plant. It should be looked upon as a serious weed in all cultivated soils.

Control.—Preventing the weed from becoming established is, of course, preferable to attempting its eradication at a later date. As soon as it is noticed it should be forked out and burned, remembering that the destruction of the underground parts is essential. On larger areas the land may be ploughed in the early spring before the plants have an opportunity to flower, following up with a spring-tyne cultivator as often as may be necessary during the summer. This has the object of bringing the underground stems to the surface, that they may be destroyed by exposure to the heat of the sun. With the first rains of the following season oats, or some other heavy smothering crop, should be sown.

The use of lime, so often advocated for the destruction of sorrel, is not in general an economic or effective method of control in Western Australia. Its success in Great Britain and elsewhere is probably due to its beneficial effects upon other vegetation enabling the latter to crowd out the weed.

The most economical method of dealing with sorrel in badly affected areas is to put the land under pasture. Eradication by means of cultivation is slow and comparatively expensive, and it is doubtful if it pays to keep land in cultivation when it is badly infested with sorrel.

If clovers, particularly Subterranean Clover, are established on infested soils, and top-dressed regularly with superphosphate, the sorrel will disappear in time. In the meanwhile the clover will give a good return as pasture. If the soil is wet or poorly drained, Drooping-flowered clover (*T. cernuum*) is superior to Subterranean Clover. Drooping-flowered clover is becoming quite common on the moister soils of the South-West, and usually becomes established without sowing. This is fortunate as seed is rarely available for sale.

Description of Plant.—A perennial herb, with a creeping rhizome, and slender erect stems 4-18 inches in height, often turning red. Leaves alternate, the lower ones usually hastate or sagittate at the base, the upper ones usually narrower, to lanceolate, or even linear, all glabrous, petiolate. Stipules thin and scarious, usually white or silvery, forming a ring or sheath around the stem. Flowers small, dioecious, in slender terminal panicles, the clusters numerous, few-flowered, without floral leaves. Perianth-segments 6, broadly ovate or orbicular, entire, obtuse, the three inner ones slightly smaller, and closing over the fruit. The male flowers have six stamens. The female flower has a triangular, one-seeded nut which is usually longer than the perianth segments, and bears when in the flowering stage a three-pronged stigma.

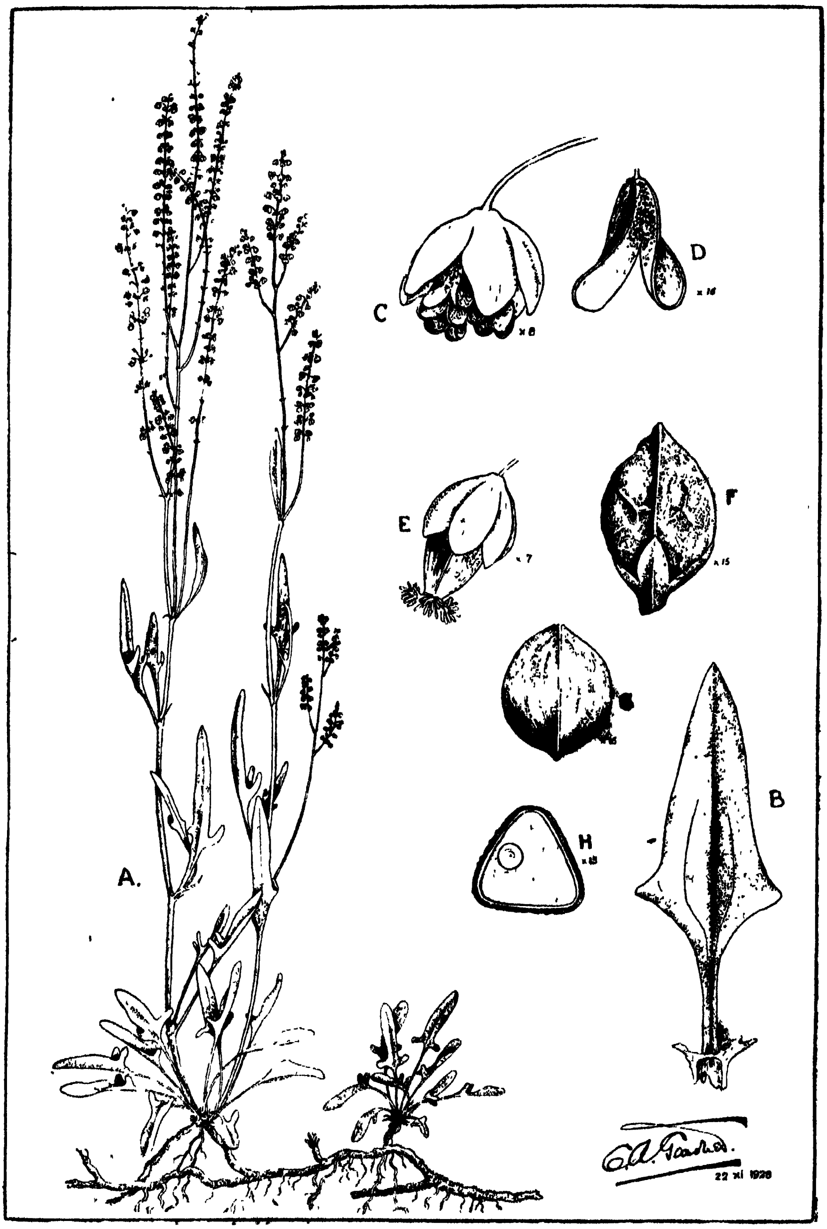
For further particulars see plate. The habit of the plant is usually erect, but is exceeding variable. Fully developed plants, which are dwarfed, can be always seen in some situations. The shape and size of the leaves also vary. The plant illustrated is a tall grown form from Maddington, in sandy soil; the separate leaf is taken from a smaller more robust plant grown in heavier soil.

SORREL.

Rumex acetosella.

Explanation of Plate.

A. Habit (half natural size).
B. Leaf, natural size.
C. Male flower.
D. Anther.
E. Female flower.
F. Fruit.
G. Seed.
H. Section of seed showing triangular shape.



SHEEP SORREL.
(*Rumex acetosella*, Linn.)

DROOPING-FLOWERED CLOVER.

(*Trifolium cernuum,* Brot.)

W. M. CARNE, C. A. GARDNER, and G. K. BARON-HAY.

DESCRIPTION OF PLANT.

A glabrous annual herb, normally diffuse, but frequently in favourable situations so dense that it forms thick masses of up to one foot in height or more, the stems weak, hollow and ascending. Leaves on long petioles, leaflets obovate or ovate-cuneate, denticulate, more or less strongly veined. Flowers pale pink, very small, numerous in loose pedunculate heads, each flower shortly pedicellate. At the time of flowering the flowers are erect or spreading, but after fertilisation the flowers are bent downwards (reflexed). Standard notched at the apex, not much longer than the calyx. Pod included in the calyx, 2-3 seeded. The plant is native to Spain and the Mediterranean region.

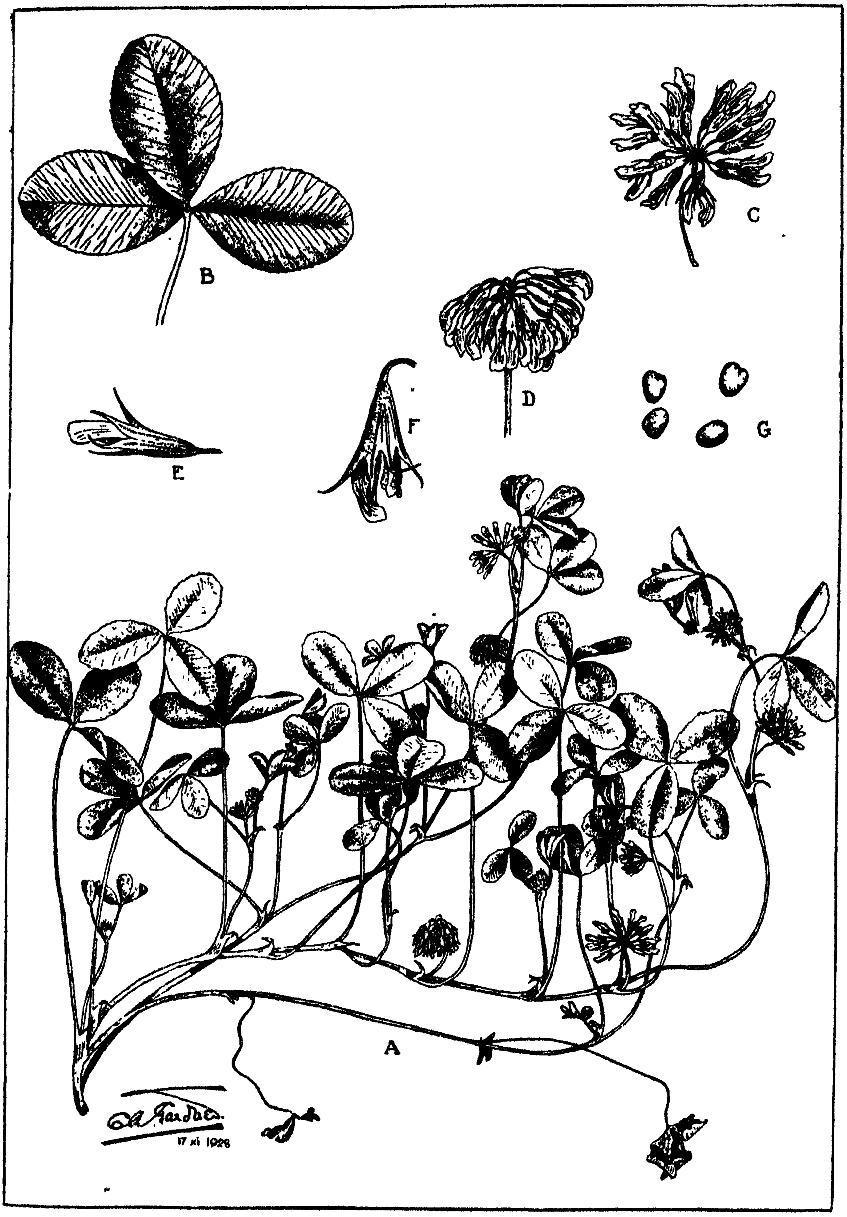
According to Mr. W. C. Grasby, it has been known to occur in Western Australia for at least twenty years, being first noted by him at Gingin, and known as "Gingin Clover." It is now widely distributed throughout the South-West, the South Coastal and Great Southern districts. The plant is known in the South-Eastern districts of South Australia, but has not yet been recorded in Victoria or the other Australian States.

Unlike Subterranean Clover, the Drooping-flowered Clover prefers moist, or even wet soils, and will withstand inundation in the winter months, but in drier soils it is not as successful as Subterranean Clover. The two clovers complement each other; one confined to moist depressions and the other to the better drained soils, the line of demarcation being frequently quite distinctly marked.

In favourable places Drooping-flowered Clover is as prolific as Subterranean Clover, has finer stems, and is as readily eaten by stock, if not preferred. The seed is light yellow and very small. It is produced in great quantity, and resembles that of Cluster Clover, but has a more prominent radicle. Unlike Subterranean Clover, which has the seeds contained in "burrs," the seed of Drooping-flowered Clover falls out of the small pods, and may be seen as a yellow layer covering the soil when the mat of clover is lifted after it has dried off. The seeds are not usually obtainable through the ordinary channels of seed-trade, but small parcels are sometimes available from farmers. The price ranges from eight to twenty shillings per pound, and the seed contains a varying amount of impurities according to the method adopted in harvesting. The best method of gathering seeds is to wait until the first seeds commence to shed, then cut the clover and spread the plants on a canvas or other sheet, which collects the seeds as they fall.

The percentage of hard seeds is frequently high. Ten pounds of clean seed collected in 1924 gave poor results on wet flat treeless country at Young's Siding during the first year, but excellent results were obtained in subsequent seasons. It has been found on the semi-swampy areas to the west of Harvey, Yarloop and Waroona, that applications of superphosphate were necessary to induce this clover to grow, and the same has been demonstrated at Wagerup.

In making hay from Drooping-flowered Clover the plants should be cut when in flower, as the ratio of fibre increases as the seeds develop.



DROOPING-FLOWERED CLOVER.
(*Trifolium cernuum*, Brot.)

Explanation of plate.

A.—Portion of Plant (half natural size) showing ascending habit.
B.—Leaf (natural size).
C.—Flowering head (natural size).
D.—Fruiting head (natural size).
E.—Flower × 4.
F.—Fruiting calyx × 4.
G.—Seeds × 4.

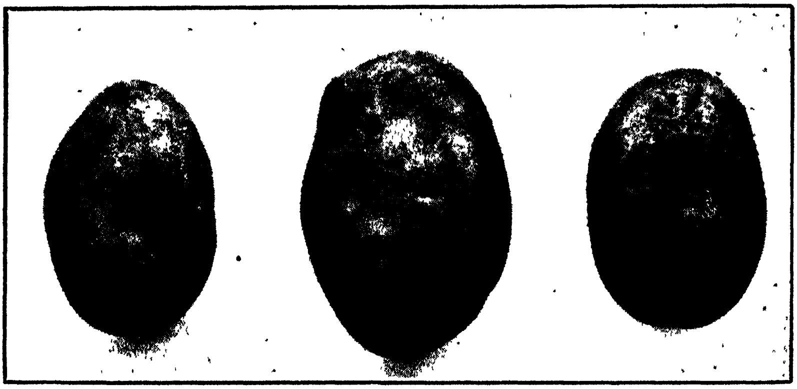
POTATO CHIPS.

G. N. LOWE,
Senior Potato Inspector.

Mixing Fertiliser.—A cheap, simple and effective method for the mixing of fertilisers was recently noticed when the writer was on the property of Mr. "Cedar" Armstrong near Yallingup.

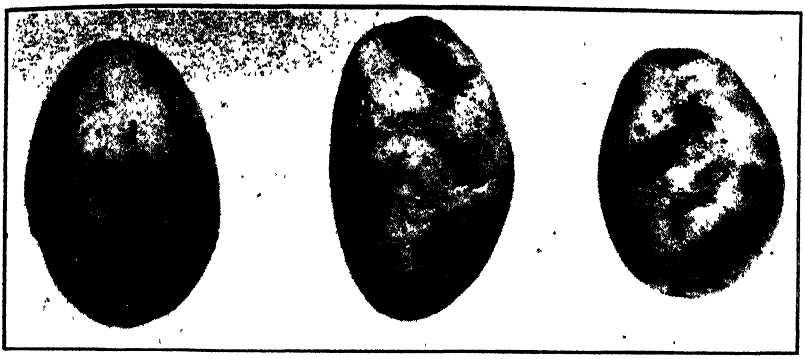
Mr. Armstrong, as is the case with numerous other potato growers, pins his faith to fertiliser of his own composition, and, instead of using a shovel to turn the ingredients on a floor as is the usual way, pours his materials in their respective quantities on to an old sail which he has had for some years, taking care that he then spreads each quantity in a thin layer over the last. Then grasping a corner of the sail in each hand he walks forward to somewhere near the opposite side, lifting and lowering each corner as he progresses. This is repeated from each side in turn, when the mixing is thorough and complete and only takes a matter of a minute or two. By placing on the "mixer" (a square piece of hessian will do quite well) just what the operator can comfortably lift, the whole mass can then be—after mixing—poured into a bag suspended conveniently.

Observance of directions for dipping in warm formalin mixture.—The following illustrations depict the necessity for the strict observance of directions when dipping seed in warm formalin solution as recently described in this journal. Indeed, strict adherence to the correct formula is naturally vital to the success of any similar operation, and it is astonishing how often the writer in his travels finds instances where growers have either—"off their own bat" or because a neighbour does so—made some variation as to time, strength of solution or wrong ingredient in a preventive or curative treatment, and then condemn whole-heartedly and utterly all such treatments instead of their own pet variation of them.



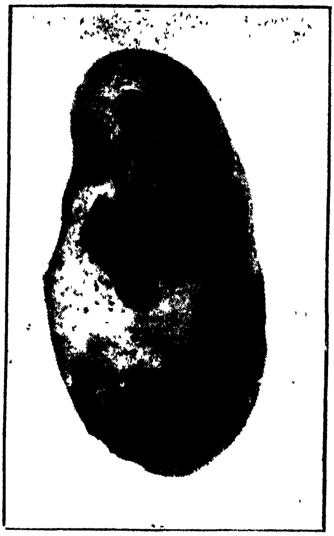
Seed dipped in warm formalin solution and kept covered for one hour only (the correct period) after dipping.

Illustration No. 1 shows seed dipped for *two minutes* in the formalin solution composed of 2 pints of formalin to 30 gallons of water warmed to *120 degrees* Fahrenheit and kept covered for *1 hour only* (the correct period) before turning out to dry in the open.



This seed was kept covered for 24 hours after dipping, prior to racking. Note the injury occurring.

Illustration No. 2 depicts what happened after holding the seed under cover for 24 hours before drying off, although the other directions were observed.



Tuber kept covered for 48 hours after dipping. The injury is much greater, and may easily cause rotting when planted.

Illustration No. 3 shows a marked increase in the pitting and injury to the skin of the tuber, and this is accounted for by the fact that the grower submitting the sample left the seed covered for 48 hours before turning it out on to his racks.

The injury has all the appearance of the well-known storage trouble, and although it has not completely ruined the tuber from a seed standpoint, it cannot well be claimed that this particular "over thoroughness" is an improvement, to put it midly.

Lower Kalgan Country.—The latest district to provide excellent seed under the Certified Seed Scheme is the hill country on the Lower Kalgan about 12 miles east of Albany. In this district, hill lands timbered largely with a mixture of red gum and yate, and of rich chocolate soil can be planted in March and harvested in July, and so provide seed much sought after by the swamp growers of Narrikup, Redmond and along the Denmark line, who plant in October and November.

Fine crop of Delaware, grown by Mr. H. C. Poole, Lower Kalgan.

A very keen and careful grower in Mr. H. C. Poole, together with Messrs. A. & J. Hopson, who also are growing good crops, were successful this season in having the bulk of their yields certified to and were able to dispose of all their surplus immediately at highly remunerative rates. It is expected that this seed will make its presence felt in the next cropping.

A very fine opportunity for careful growers in the Lower Kalgan district exists for the provision of similar seed for the Great Southern swamp areas, and although last season with its early dryness, and heavy winds and wet towards maturity, certainly were not ideal from a standpoint of heavy yield, returns of from 6 to 8 tons per acre were obtained.

Mr. Jack Hopson pondering as to how he will invest the proceeds of this excellent crop of Delaware.

A world's record yield on an acre.—What potato grower would not like to produce 27 tons 17 cwt. of tubers on one acre of land?

The feat, which it is claimed is a world's record, was accomplished last year in California by Messrs. Zuckerman Bros., who annually crop about 1,500 acres of peat lands under irrigation.

Those growers at Young's Siding who have grown up to 20 tons per acre on portion of their peat soils have now something for which to strive!

THE TREATMENT OF BOWLING GREENS, TENNIS COURTS AND LAWNS.

The following notes have been put up by officers of the Department as numerous requests for information in connection with the treatment of tennis courts and bowling greens have been received:—

1. Periodical forking of the ground to a depth of 6 or 8 inches in order to aerate the soil should be practised during the winter and before the annual levelling process, say, in July.

2. Unless the land is known to be of limestone formation, as is the case in some parts of Cottesloe and Fremantle, it is advisable to apply in July, once in two years, a dressing of "quick" or builders' lime, after it has been water slaked to a powder, at the rate of 4 ozs. per square yard—

Tennis Court (120ft. x 60ft.)	200 lbs.
Bowling Green (120ft. x 120ft.)	400 lbs.
Bowling Rink (120ft. x 20ft.)	66lbs.

If air slaked lime or agricultural lime is used, double the amounts stated should be applied.

3. Early in August apply muriate of potash or sulphate of potash at the rate of 2/5th oz. per square yard—

Tennis Court	20 lbs.
Bowling Green	40 lbs.
Bowling Rink	14 lbs.

and superphosphate at the rate of 2 ozs. per square yard—

Tennis Court	100 lbs.
Bowling Green	200 lbs.
Bowling Rink	33 lbs.

4. If diammonphos (or "Floraphos") is to be used for supplying the nitrogen, as in paragraph 6, then the dressing of superphosphate can be omitted.

5. The application of muriate of potash or of sulphate of potash and superphosphate in August should be followed by a light scraping of clean sand in the case of bowling greens or stiff loam for tennis courts, just sufficient to secure a smooth level surface. The object of this annual levelling is to fill up the worn places, and as the addition of sand or other material has little or no nutritive value, and in consequence the dressing for the levelling process should be as light as possible, otherwise much of the grass will be destroyed and the use of the lawn delayed. The later the levelling is left the quicker the surface is fit for play, as couch grass only grows profusely in the heat of summer.

6. Following the levelling process the ground should receive an application of nitrogen, either in the form of sulphate of ammonia, nitrate of soda or diammonphos ("Floraphos") at the following rates:—

Sulphate of Ammonia or Diammonphos or Floraphos	1/8th oz. per sq. yd.
Tennis Court	7 lbs.
Bowling Green	14 lbs.
Bowling Rink	2½ lbs.
or	
Nitrate of Soda	1/6th oz. per sq. yd.
Tennis Court	9 lbs.
Bowling Green	18 lbs.
Bowling Rink	3 lbs.

7. The application of these nitrogenous fertilisers should be continued monthly for the period during which the greens or lawns are to be used; after the first two applications the quantity may be reduced to half the above amounts.

8. The fertilisers can be distributed in the dry form by hand with or without a mixture of sand to ensure even distribution, as liquid fertiliser through a watering can, or by means of the "Floraphos" distributor, which enables the fertilisers to be applied in liquid form whilst the greens are being watered.

9. To ensure a hard compact surface for play the mowing should precede the sprinkling, and this in its turn should be followed by rolling.

THE SUMMER GROWING OF POTATOES.

W. E. Collins,
Potato Inspector.

Potatoes grow in many climates, but temperature is a limiting factor. The optimum soil temperature is around 65 deg. F. Heavy production cannot be obtained with very much variation from this range. It is very difficult to measure the adverse effect of too high a temperature, but it undoubtedly has more effect at certain times in the life of the plant than at others.

High temperatures at the time the young tubers are forming is likely to be harmful unless all other conditions are just right.

The potato is particularly sensitive to irregularities in both temperature and moisture. Tuber formation begins when the plants are five to six inches high, and is completed by the time the flower buds are formed.

Conditions during this period determine the number of tubers formed. Many crops have indicated by their vigorous growth and large tops, prospects of heavy yields—only to disappoint; the grower on digging finding an average of three or four tubers only to the plant. A spell of hot weather at the tuber forming period was undoubtedly one of the reducing agents. From the beginning of the flowering period until the plants are dead, the tubers grow at a regular rate if uniformly favourable conditions exist. Hence conditions during this period determine the development of the tubers, especially as to size, smoothness and shape. It has been noted that under certain conditions tubers tend to elongate and develop the "carrotty" type. This, certainly, may be associated with dry hot summers.

While factors other than soil temperature may influence the size of the tubers, it is recorded definitely that soil temperature is an important factor in determining their shape.

The writer has in mind stocks of Delaware potatoes held on racks for seed purposes, at the Department of Agriculture during the season of 1926. These having been dug from the peat swamps at Young's Siding, from the Benger Swamp, some from the Collie River flats, whilst others were grown in moist black sand on the Peel Estate. The comparison was astounding, those from Young's Siding being long—up to 18 inches in length—cucumber-shaped, with an equal diameter from end to end.

The tubers from Benger Swamp were the extreme opposite, being dumpy and round. The Peel Estate potatoes, on the other hand, were flattened and wide, tapering slightly at each end. Only those from the Collie River flats conformed most nearly to what is judged to be good Delaware type.

The above were shown to Mr. X (potato expert of Victoria, just then on a visit to this State), and he was asked to express an opinion as to whether they were four distinct varieties. Mr. X was both confounded and nonplussed when informed that they were not only the one variety, but had been grown from the same stock in each instance.

There is a growing idea that seed from Southern districts is more vigorous than that from more Northern localities. Certainly, it is true that potatoes grown under cool, humid climatic conditions are better than those grown in hot sections. Seed grown in the Denmark area, with its more nearly ideal potato-growing season, may equal or surpass in producing quality that grown in the South-West. Climate, no doubt, has some direct effect on the vigour of seed potatoes, it also has been found that high temperature mask the effect of certain diseases, especially Mosaic, so much so, that it is not possible to rogue out the diseased plants effectively from crops intended for seed. These diseases are manifested more clearly in cooler, moister sections. Thus, the climatic factor may have much to do with the elimination of diseases such as Mosaic, which under severe climatic conditions weakens the plant without being readily visible.

There is another factor in location too. Some places are relatively free from aphids and other insects, and therefore enjoy a natural advantage in production of healthy seed. Where the potato-destroying insects occur in large numbers it is impossible to keep up disease-free seed stocks, even when some "rogueing" is done.

It seems very probable that soil temperature may in part account for the irregular results obtained in much of the seed treatment for scab control. There is some indication that excessive scabbing is largely due to the fact that tuber development takes place most times during the hot part of the season.

Very frequently growers report good results from certain seed treatments, and in following years the same treatment may fail to wholly control the disease on the same soil. Soils containing only a moderate infestation of the scab organism would not produce much scab during a cool year, whereas a considerable amount of the disease would be likely to occur during a hot year, even though the seed be well disinfected. Of course, it must not be forgotten that other influencing factors, such as soil moisture, lack of humus also play their part with soil temperature in explaining such irregular results in seed treatments. Other defects connected with unusually hot weather are "fleck" and "black heart." The former, an internal browning, appearing as streaks or isolated brown dead spots in the middle portion of the tuber. If the weather is hot and the soil dry, this type of injury may be reduced by digging the tubers as soon as the tops begin to die. "Black heart" is a result of suffocation of potato tissue. Purplish-black discolouration internally may arise from too high temperatures or poor ventilation, or a combination of both. Newly dug potatoes exposed too long to the hot sun may be seriously over-heated. Hot, ill-ventilated sheds is another cause. Cool airy storage is the preventative.

High temperatures at the time of planting may be a serious factor. In hot soils excessive rotting of the seed pieces has been observed. No means of preventing this decay has yet been found. The healing of the cut surface by means of the "wet bag treatment" prior to planting offers the most promising line of attack.

Recorded soil temperature in unshaded soil at a depth of two inches averages from 1 deg. to 8 deg. higher than shaded air temperatures. When the same soil is shaded the temperature is approximately the same as the air temperature. In a potato field we have the latter condition, and soil temperatures at about four inches will average from 1 deg. to 2 deg. below the air temperatures.

MOISTURE AND NITRATE FLUCTUATIONS IN MULCHING EXPERIMENT PLOTS,

STATE EXPERIMENT FARM, MERREDIN.

L. J. H. TEAKLE,
Plant Nutrition Officer.

The study of nitrate and moisture fluctuations in soils has been carried out in other parts of Australia and in other countries of the world. It has been found almost invariably that cultivation favours the accumulation of nitrate in the soil solution and also economises the soil moisture due to the killing of weeds and the formation of a soil mulch. In order to better evaluate the benefits of fallowing and to study methods suitable for the attack of our soil problems in Western Australia, it was decided to sample systematically the soils in the mulching experiment plots at the State Experiment Farm, Merredin, during the year 1928. Sampling was commenced in February and continued at intervals until the end of October when the wheat was in the dough stage. It is probable that another sampling in February, 1929, will prove fruitful as indicating the recovery of the soil but the information is sufficiently complete at this stage to review the results and to publish them for the possible benefit of those interested in soil science as well as in soil products.

METHODS ADOPTED.

The mulching experiment plots were selected as being suitable for preliminary work, and were sampled by means of a 1½in. auger to a depth of about two feet. In certain instances this depth was divided into—

1. mulch—the loose surface soil;
2. first foot under the mulch;
3. second foot under the mulch.

During the growing period it was impracticable to sample in such detail only the first foot being sampled. Each plot was sampled at three sites—

1. near the south end;
2. in the middle;
3. near the north end.

At the final sampling in October the samples were only taken at the ends in order to avoid damaging the standing crop. As each plot was replicated five times, each treatment was represented by at least ten or fifteen samples. The soil was placed in tins, and bacterial action checked by means of toluene which was applied in pieces of cotton wool. The tins were closed by means of lever top lids, which were vaselined to improve the contact and make a more effective seal. It was necessary to transport the samples to Perth for analysis.

The plots were treated as follows:—

1. Fallow cultivated after ploughing, and thereafter following every twenty-five points of rain.
2. Control. Fallow cultivated after ploughing and before seeding.
3. Neglected Fallow. Cultivated before seeding only.

It must be remarked that owing to the abnormally dry summer the difference in the actual cultivations, which the plots received was small so that very similar results would be expected. Of course, local anomalies invariably occur due to the great variability of the soil, but these differences are ironed out when the averages are considered.

The results of the analyses are given in Table 1 and Table 2. The curves in Figure 1 and Figure 2 show the fluctuations of moisture and nitrate in the soil of the first foot in the plots.

TABLE 1.

The moisture contents of plots of the Mulching Experiment, State Experiment Farm, Merredin, during the season of 1928. *The plots were seeded on 30th April,* 1928.

Date of sampling.	Treatment 1—Fallow cultivated after ploughing and thereafter following every fall of 25 points or over of rain.			Treatment 2.—Control. Fallow cultivated after ploughing and before seeding.			Treatment 3.—Neglected Fallow. Fallow cultivated before seeding only.		
	Mulch.	1st foot.	2nd foot	Mulch.	1st foot.	2nd foot.	Mulch.	1st foot.	2nd foot.
	Water.	Water.	Water.	Water.	Water.	Water.	Water.	Water.	Water
1928.	%	%	%	%	%	%	%	%	%
Feb 28 and 29	1 63	7 94	12 57	1·40	7·10	11·38	1·62	7·44	9 77
April 23 and 24	2·43	9·29	11 88	2·93	9·52	11 46	2·88	8 83	10·39
June 26 ...	.	9·57	...	. .	9·26	..	...	9·14	. .
July 30 ...		All sam	ples were	high in	moisture	averaging	13% wa	ter.	
Oct. 26 and 27	.	4·92	9·49	..	4 68	9 05	...	3·68	7 20

TABLE 2.

The Nitrate contents (pounds of nitrate nitrogen in one million pounds of soil) of plots of the Mulching Experiment, State Experiment Farm, Merredin, during the season of 1928. *The plots were seeded on 30th April,* 1928.

——	Treatment 1.—Fallow cultivated after ploughing and thereafter following every fall or 25 points or over of rain.			Treatment 2.—Control. Fallow cultivated after ploughing and before seeding.			Treatment 3.—Neglected Fallow. Fallow cultivated before seeding only.		
	Mulch.	1st foot.	2nd foot.	Mulch.	1st foot.	2nd foot.	Mulch.	1st foot.	2nd foot.
1928.	lbs.	lbs.	lbs.	lbs.	lbs	lbs.	lbs.	lbs.	lbs
Feb 28 and 29	25·3	10·3	11·1	24·2	8·5	15·0	11·4	4·9	10·2
April 23 and 24	12·2	8·1	3·8	11·5	10·0	6·5	14·2	4·1	3 6
June 26 ...	...	10·0	...	...	10·9	..	...	9·4	...
July 30 ...	...	3·3	...	...	2·5	...	...	1·8	...
Oct. 26 and 27	...	1·6	0·7	...	1·1	1·4	...	0·9	1·3

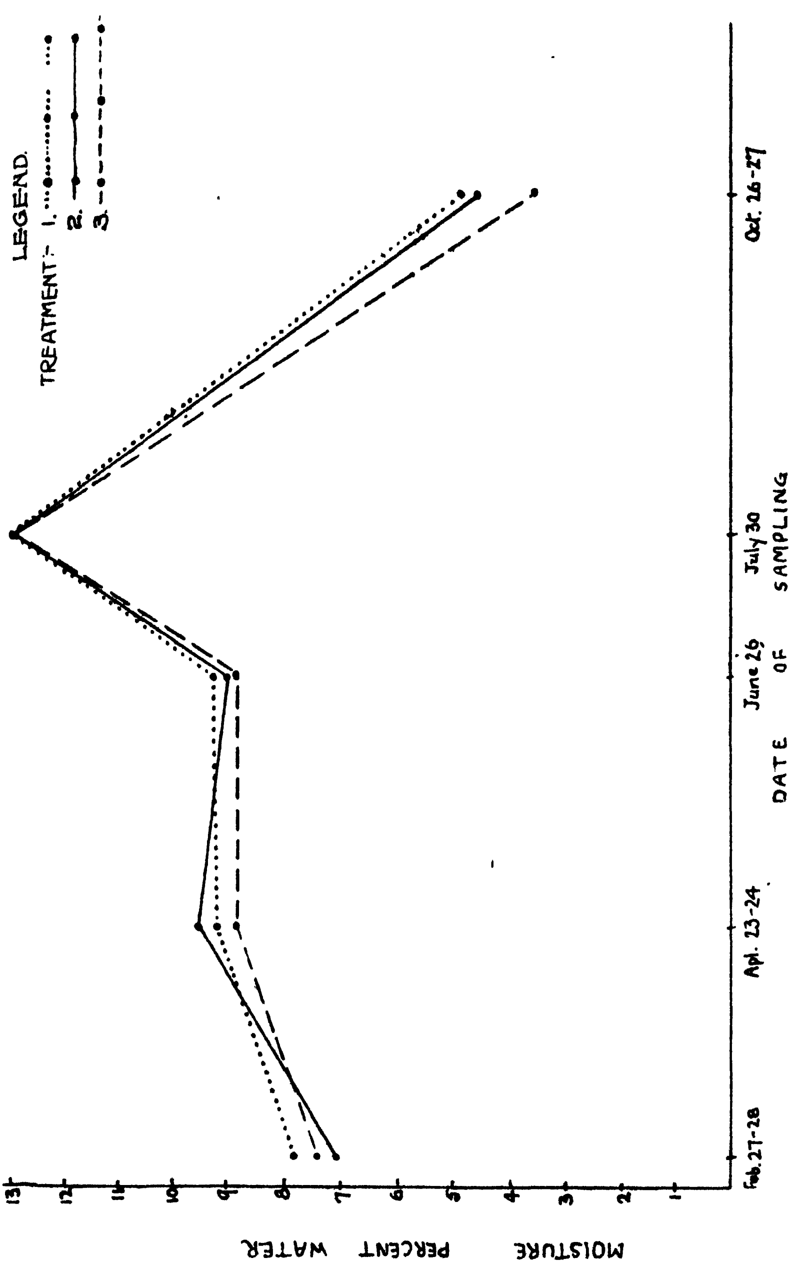


Fig. 1.—Fluctuations in moisture content of the first foot of soils from the Mulching Experiment Plots, State Farm, Merredin.

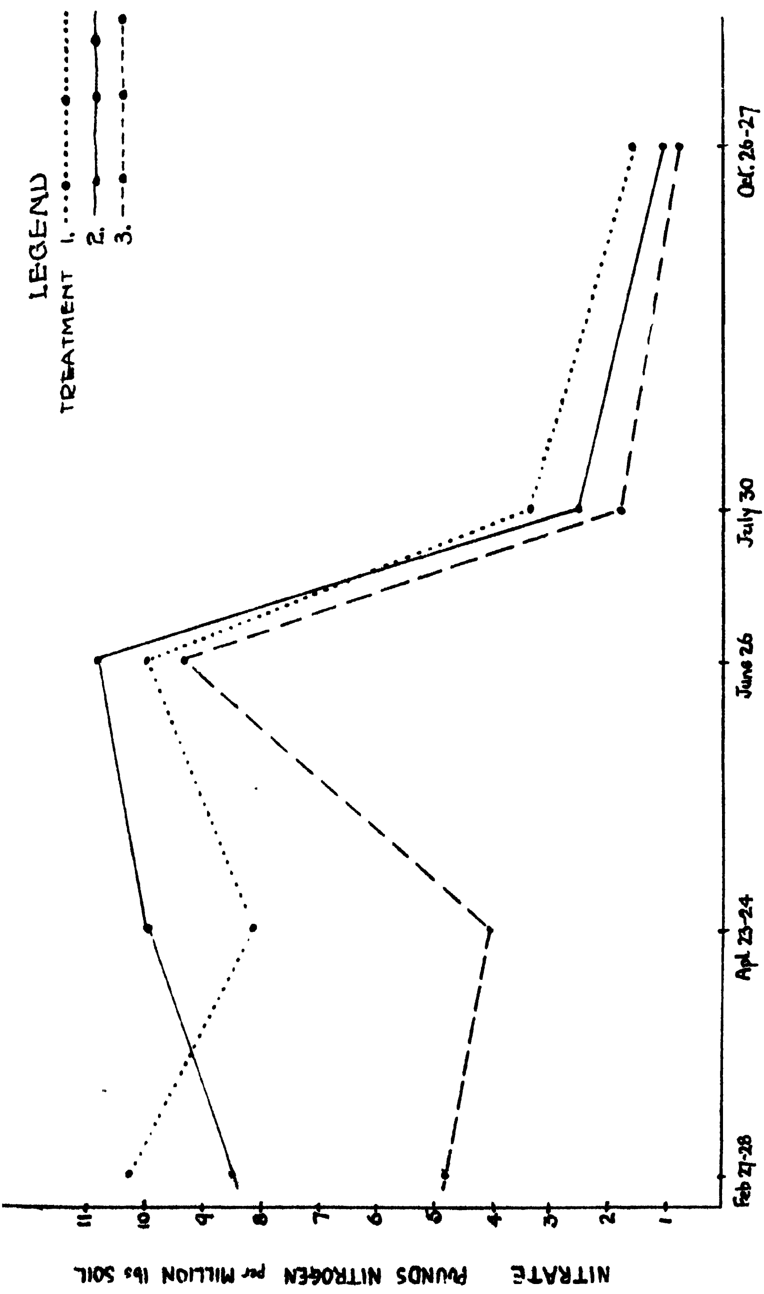


Fig. 2.—Fluctuations of nitrate nitrogen in the first foot of soils from the Mulching Experiment Plots, State Farm, Merredin.

CONCLUSIONS.

Insufficient information has been obtained in the short time available for any general conclusions to be suggested. It will be necessary to continue the work over a number of years in order to evaluate the seasonal and other factors. Certain features, however, are manifest.

1. The growing crop absorbs nitrate from the soil faster than it is replenished by soil processes. This normally occurs in cropped soils, the nitrates being more or less completely absorbed by the time the crop is beginning to run to head.

2. The soils of these plots are well supplied with nitrate nitrogen, particularly if cultivated. Reckoning an acre foot of soil as weighing four million pounds it may be calculated that on 28th February, 1928, the plots under the control treatment 2 contained about 120 lbs. of nitrate nitrogen per acre in the surface 2 feet. Similarly those under treatment 3 contained 70 lbs., and under treatment 1 180 lbs. of nitrate nitrogen per acre, in the surface 2 feet. When it is remembered that a considerable portion of this supply is present in the mulch just where the young seedling will need it, it seems that the salmon gum and gimlet soils at Merredin must be well supplied with nitrate nitrogen for the young crop. Warrington states that 50 lbs. of nitrogen are required for a 30-bushel crop. It seems hardly likely that nitrate is the limiting factor in the Mulching Experiment Plots at Merredin.

3. The treatments did not affect differentially the moisture content of the layer of soil to a depth of one foot. There seems however, a real difference in the moisture content of the soil between 1 foot deep and 2 feet deep. The difference is in favour of the cultivated plots (treatments 1 and 2) to the extent of about 25 tons of water per acre, which is equal to about 25 points of rain. Apart from the improved physical condition of the soil resulting from the cultivation and a greater freedom from weeds it seems that at the beginning of the season the cultivated plots are chemically in a better condition than are the neglected fallow plots. The grain yields during the period 1916 to 1927 show a 6 per cent. improvement, resulting from fallow cultivation in the spring, thus correlating quite well with the results obtained in this study.

Acknowledgment is made of the assistance of Messrs. G. L. Throssell and G. Burvill in the work at Merredin. The analytical work was performed in the laboratory of Professor Paterson at the University of Western Australia. Thanks are due for the use of the facilities and apparatus made available for this work at the University.

MINERALS AND THE HEALTH OF CATTLE.

A. B. ADAMS.

Much water has flowed under the bridge since the writer penned an article on the above subject (W.A. Dept. of Agric., "Jour.," Vol. 1., No. 2), and, as during the time that has elapsed since its publication, it has been realised that the losses due to mineral deficiency are even more serious and widespread in the State than was realised at the time, and as, further, throughout the world mineral deficiency in stock has been the subject of numerous experiments by research workers, the time is now ripe to further consider the position and amend our practice in the light of modern knowledge.

To touch first on our local experiences: In 1924 it was realised that stock became cripples, or even died from malnutrition, and possibly died from chewing carrion that had been infected with a bacillus producing a poison, We now know that deaths from carrion poisoning are widespread. These deaths in the majority of cases were so sudden and so similar to plant poisoning that plant poisons were almost invariably thought to be the cause. In many cases, however, close search failed to reveal any poison plants and enquiry nearly always elicited a history of bone chewing.

Now the practice of giving phosphatic licks to stock has become more general, and this is a great advance, but there is great room for improvement in the simplification and cheapening of the licks used.

In the previous article, the writer was inclined to lay stress on the importance of the proportion of lime to phosphate; in this, following Ingle. Certainly some local experience appeared to bear this out, as cattle that had a change to the limestone soils of the coast from the inland soils deficient in lime were not so subject to cripples. On the other hand, some farmers, who did not change their cattle, stated that by the use of bran they kept their stock healthy and free from cripples.

We now know that the diseases which Ingle attributed to excess of phosphoric acid with a deficiency of lime was not a deficiency disease, but was of bacterial origin.

The present position, as regards local knowledge and recent work in other parts of the world, may first be glanced at. We may then profitably consider the best and most economical methods of tackling our troubles.

Within the State we know, definitely, that a deficiency of bone-forming material in the feed is a cause of serious loss to stock owners. In addition to the deaths of stock, both sheep and cattle, from chewing bones and carrion infected with the poison producing organism, there is probably an enormously greater loss every year from inferior development, lessened production of meat, milk products, wool, and last, but probably not least, irregularity in breeding.

We know further that these troubles can usually be overcome by the provision of licks containing phosphate, and by fertilising our pastures with superphosphate.

Our local knowledge and experience has not thrown much light on what is really the best lick to use. Those in general use are some one of the proprietary licks or sterilised bone meal, super., or basic super., and ground rock phosphate, according to fancy and obtainability, either alone or mixed with lime, common salt, sulphate of iron, etc.

Of investigations pursued in other countries, those of Sir Arnold Theiler and his co-workers in South Africa have many lessons for us showing us the elements which are most essential with their relative importance.

Considering their results and conclusions the following lessons are learnt:

1. Cattle suffering from a serious deficiency of phosphoric acid in the feed become cripples, and eventually die if not relieved.

2. An excess of lime does not make up for deficiency of phosphoric acid; on the contrary, extra lime renders the small amount of phosphoric acid less available and produces cripples sooner than would be the case with less lime.

3. Cattle receiving plenty of phosphoric acid in the shape of a liberal bran ration with a very limited amount of lime grow normally and do not develop cripples.

4. Common salt, though necessary, was not required in large amounts; animals making normal growth on much smaller quantities than are usually taken by the animal when it has free access to salt.

5. An experiment carried out at the same time showed that disease, due to lack of vitamins A, B and C, was not likely to occur under any natural conditions of cattle raising.

There is no reason to think that Western Australian stock suffer from lack of minerals other than phosphates, except possibly on comparatively small areas. The supply of a sufficiency of phosphoric acid usually ensures healthy growth.

In the light of the above results, and taking advantage of Queensland experience given below, there is much room for the simplification and cheapening of the licks used, our object being the supplying of a sufficiency of digestible phosphoric acid as cheaply as possible.

Possible sources of phosphoric acid are finely ground Nauru or Ocean Island rock phosphate, basic superphosphate, or sterilised bonemeal, taking them in their order of cheapness per unit of phosphoric acid.

At present the publication of the analysis of proprietary licks is not compulsory, but it is common knowledge that some of them contain much common salt. In the absence of a published analysis it is impossible to criticise all the ingredients and to consider how far they are useful. These prepared licks probably serve a useful purpose in stressing the importance of a supply of mineral matter, and may be convenient where they do not need mixing. The careful stock owner, however, will do well to consider the supply of phosphoric acid in a cheaper form, this being the substance which we know to be lacking in almost every portion of the State. It is time enough to consider the supply of other minerals when it is found that animals fail to thrive when supplied with sufficient phosphoric acid and common salt.

Of the substances given above, finely ground rock phosphate should be used much more extensively than it is, as not only does it contain a very high percentage of phosphoric acid it is also safe to feed without being first sterilised. It has but one disadvantage, stock do not recognise it as a substance containing phosphoric acid, and therefore will not take it by itself. This difficulty may be overcome in any of the following ways:—

(1) If the stock are being hand-fed, the phosphate may be fed mixed with the feed.

(2) If not being hand-fed, the phosphate may—

(a) be mixed with a small amount of bran or pollard or other meal, and fed in boxes, allowing one or two boxes more than the number of animals to give the weaker ones a chance. If the herd is large a yard may be erected between two paddocks, a convenient number allowed into the yard at one time, and as soon as they have consumed their handful of meal and phosphate, which will take a very short time, passed out and another lot admitted;

(b) be mixed with enough salt to give it a salty taste, and given as a lick, and then the animals will obtain sufficient salt and the necessary phosphate. The stock owner is advised to have as low a proportion as possible of salt to make sure that the animals take sufficient phosphate; too much is better than too little phosphate; it is possible to take too much salt.

It has been stated that Nauru phosphate has caused digestive troubles among sheep, owing to its high percentage of insoluble silica.

This statement is not correct, as Nauru phosphate is almost pure tricalcic phosphate of lime, and on treatment with acid dissolves, leaving a negligible residue.

As to causing digestive troubles, the following letter received from Mr. Brunnich, Agricultural Chemist to the Queensland Department of Agriculture, speaks for itself:—

Department of Agriculture and Stock,
Brisbane,
5th November, 1928.

Dear Sir,

Some have for some time tried to belittle the value of Nauru phosphate as a lick, and made repeatedly statements that such phosphate causes digestive troubles, with ulceration of the intestines, etc., and therefore during my last trip through a large portion of our sheep country I made a special enquiry into this question and could not find any case where Nauru phosphate used as a lick had caused the slightest trouble during the last three years.

In all cases the reports on the results following the use of Nauru phosphate licks are most encouraging, and in some cases the results are quite phenomenally good, one owner reporting an increase of his average holding of 40,000 sheep up to 85,000 during the last years of the drought, by the use of several hundred tons of Nauru phosphate, and he also reports general improvement in health, practical disappearance of bottle and worm troubles, and great reduction of losses due to blowflies, and he is positive that he never found the slightest signs of digestive troubles. Salt, used as a lick, has in the past years of drought caused serious troubles and thousands of sheep died all over the State due to salt poisoning.

My advice is to give less salt and more phosphate in the form of licks to cattle and sheep.

Nauru phosphate being not only cheaper but contains so much more phosphoric acid than bone meal, and does not require sterilisation, is an excellent substitute for the latter, and my latest recommendation is the use of one part of salt, not too coarse, two parts ground Nauru phosphate, Only very occasionally the addition of Iodine, Sulphur, etc., may give beneficial results.

(Signed) F. BRUNNICH,
Agricultural Chemist.

Mr. Brunnich's letter is most interesting and informative, showing as it does that Nauru phosphate is suitable as a lick in all conditions if sufficiently finely ground. The warning that it is possible to give too much common salt is also important.

As was pointed out in the previous article, the deficiency is most pronounced when the pasture is dried up, the stockowner is therefore urged to make sure that his stock are receiving a sufficiency of phosphate during the summer.

When the phosphate is given as a lick for the stock to help themselves, the stock-owner's chief concern will be to see that the trough contains a supply of lick, and that it is not contaminated with droppings. He should recognise that it is much better for the stock to take rather more than they need than that they should suffer from a shortage.

When the phosphate is fed direct, it is well to have some idea of the amount required per head. This varies with the class of stock, and to some extent with the kind of phosphate used.

Taking sterile bonemeal as the standard, the amount required per head per day will vary from about one ounce per day for a young calf (that is no longer receiving milk) to five ounces for a cow giving three gallons of milk a day, and an exceptionally heavy milker might require even more.

As Nauru phosphate contains approximately 50 per cent. more phosphoric acid than bonemeal, a correspondingly smaller amount may be given.

SUMMARY.

Where phosphoric acid is deficient in the soil the herbage will also be deficient, this lack causing many stock troubles.

Lime cannot take the place of phosphoric acid, and it is not advisable to give lime in licks, as it lowers the digestibility of the phosphate.

Stock do not require as much common salt as is often thought necessary, therefore, particularly where the drinking water is saline, the amount of salt given should be small.

Nauru rock phosphate, which can be obtained from the superphosphate companies as ground rock phosphate, is quite suitable for stock, and is moreover the cheapest form in which to purchase phosphate for the purpose.

Iodine, sulphur, Epsom salts, and sulphate of iron may very occasionally be necessary, but should only be given in individual cases where found to be needed.

FLAG SMUT RESISTANCE TESTS, 1928.

MERREDIN EXPERIMENTAL FARM.

by

E. J. LIMBOURN, Seedsman.

These experiments were commenced because it was realised that Flag Smut (Urocystis tritici) is carried over in the soil, and attacks the young wheat plant during the very early stages of its growth, and there is no known treatment that will prevent infection of the seedling from the soil.

The original tests, carried out by Mr. W. M. Carne, Plant Pathologist and Botanist, in his laboratory at the Department of Agriculture, proved that infection could be obtained by dusting the grain with minced infected straw from diseased plants. This provided a definite means of obtaining information regarding the resistance of certain varieties to the disease, and in 1926, it was decided to commence a field experiment, on the same lines as that used for some years with Bunt or Stinking Smut (Tilletia levis.)

Field observations had already pointed to the high resistance of the variety "Nabawa," and also to the extreme susceptibility of the variety "Gluyas Early." For this reason "Gluyas Early" was used as the control, and it has since proved to be the most susceptible of any variety yet tested.

The results of these Field Tests during 1926 and 1927 were published in Journals of Agriculture for March, 1927 and September, 1928.

The experiment this year was divided into three sections:—

1. Varietal Resistance Test. A comparison of the resistance of a number of different varieties of wheat.
2. A test of the variation in resistance of Lines (or strains) of certain standard varieties grown by the Department of Agriculture as Seed Wheat.
3. A routine test of the resistance of new crossbred varieties at different stages in the selection of fixed types.

The method of infecting the seed was the same as in previous years, excepting that all surplus infecting material was sieved off. As was pointed out in the September Journal, this is done to overcome any possibility of the infection being carried to adjoining paddocks, by wind, when planting the seed.

That the lighter infection of the seed in no way affected the final results is shown by comparing the percentage infection of "Gluyas Early" for the three years. For 1926 the average infection was 35 per cent., for 1927, it was 49 per cent. and this year 45 per cent.

The seed was planted in rows ¼ chain long in two links apart, 50 seeds to each row.

Germination throughout was very good, averaging about 95 per cent. During the months of July and August, weed growth was out of control, and a few plants were probably destroyed when cleaning out the rows. In spite of this, well over 90 per cent. of the plants lived through until September, when the first inspection was made. All diseased plants were then pulled up, and after being counted, were destroyed. A further and final inspection was made during October to ensure that all diseased plants had been noted. The remaining clean plants were then counted.

VARIETAL RESISTANCE OF WHEAT VARIETIES.

It was intended in this section, to include all varieties previously tested that had shown less than 20 per cent. infection, as well as new varieties not previously tested.

With the large number of Crossbred types to be planted, it was found that the space left was very limited, and only forty varieties, including a number of Crossbred types from the Chapman Farm section with controls could be included. Therefore only the better known or such varieties as had proved immune were planted.

The results are as follow:—

FLAG SMUT RESISTANCE TEST, 1928.

TABLE I.—VARIETIES ARRANGED ACCORDING TO COMPARATIVE PERCENTAGE OF CONTROL VARIETY.

Gluyas Early = 100% *infection.*

No infection found.	%	1 to 20% infection.	%	21 to 50% infection.	%	51% and over.	%
P 421—Bunyip ..	0	P1507—Clarendon	4	P1429—Golden King	31	P1697—Ranee	60
P1438—Dindiloa ..	0	P 223—Florence .	4	P1756—Wardfir ...	33	P1792—Joffre ..	89
P1739—Exquisite ..	0	P1194—Queen Fan	4	P1463—Patriot ..	38		
P 915—Ford ..	0	P1511—Genoa	9	P 955—Newman's Early	42		
P1800—Nolba .	0	P1721—Lilydale ..	9	P 914—Caliph ...	44		
P1445—S H.J. .	0	P1710—Rajah .	9	P1749—(Federation Nabawa)	44		
P1182—Wandilla .	0	P1786—Riverina	9	P1038—Gresley ..	46		
		P 920—Tobys Tusk	13				
		P1696—Confederation	15				
		P1750—Inderct	15				
		P 228—Comeback	20				
		P1713—Ghurka ..	20				

TABLE II.—CROSSBRED VARIETIES FROM THE CHAPMAN EXPERIMENT FARM NOT INCLUDED IN LINE RESISTANCE TEST.

Gluyas Early = 100% *infection.*

No infection found.	%	1 to 20% infection.	%	21 to 50% infection.	%	50% and over.	%
C59—(Nabawa x Bunyip)	0	C61—(Federation x Bunyip)	4	C83—(D A.C. 4179 x Nabawa)	33		
C65—(Huguenot x Indian 5)	0	C70—(Federation x Bunyip)	4	C67—(Toby's Tusk x Nabawa)	44		
C77—(Florence x Carrabin)	0	C56—(Currawa x Cowra) 15	9				
C80—(Dindiloa x Nabawa)	0	(Nabawa x Gluyas Early)	20				
C81—(Florence x Nabawa)	0						
C86—(Quality x Velvet Don)	0						

The infection of the Control Rows of Gluyas Early P159 varied from 26% to 66%. The average infection per row was 45% and this figure has been used to obtain the above comparative results.

Comparing the results for the three years that the experiment has been conducted, there are now six varieties:—Bunyip, Exquisite, Geeralying, Nabawa, Nolba and Wandilla, that have proved immune each year of the test.

Of these, Bunyip, has already been discarded from general use on account of weak straw.

Exquisite and Wandilla are Eastern State varieties that do not mature normally under our short season conditions.

Nolba, formerly M.19, is a cross between "Nabawa" and "Sunset" and does not yield too well under field conditions.

Nabawa is too well known to need any description. It is probably due to the universal growth of this variety that Western Australia owes its low percentage of loss from Flag Smut.

Geeralying is a variety that is being widely grown in the Geraldton district, but it is not so well known in the drier Eastern districts, where "Gluyas Early" because of its drought resistance is so deservedly popular. No variety of equal productivity has yet been found to supplant it, which is desired because of its great susceptibility to "Flag Smut." The results now available and particularly those with the almost fixed cross breeds point to the probability of replacing this variety with one having equal ability to yield well, but with greater resistance or immunity to the disease.

That to plant such susceptible varieties as "Gluyas Early," "Canberra," etc., is a danger to the wheat grower will be readily conceded when it is considered that large areas of these varieties are cut for hay which is distributed throughout the country as Chaff. As the name Flag Smut implies it is the flag or foliage and also the stems of the plant that show evidence of the disease, and carry the spores. Naturally, when cutting hay, any such diseased plant is included in the sheaves, and afterwards finds its way into the chaff cut from such hay.

Hereunder will be found the results of the tests with named varieties during the past three years-

TABLE III.—FLAG SMUT RESISTANCE TESTS.

A COMPARISON OF THE PERCENTAGES OF INFECTIONS WITH NAMED VARIETIES SINCE THE COMMONCEMENT OF THE EXPERIMENT.

Gluyas Early—Infection = 100%.

Reg. No.	Variety.	1926.	1927.	1928.	Reg No	Variety.	1926	1972	1928.
		%	%	%			%	%	%
1700	Alliance	.	52	..	1921	Lilydale	..	...	9
1785	Aussie	..	52	..	1708	Mahratta	..	47	...
1271	Bald Early	15	..	.	1270	Major	5	.	..
1349	Baroota Wonder	5	.	.	1709	Marmora	...	76	...
859	Baroota Wonder Early	0	0	1	1440	Merredin	105	58	...
1614	Bena	64	.		892	Minister	14	..	..
1789	Binya	.	63	..	1746	Minyip	..	31	..
1726	Bobin	..	24	..	1703	Mogul	74	..	..
1727	Boolaroo	...	21	...	1432	Nabawa	0	0	0
1736	Boonoo	.	7	.	1705	Nabob	..	49	..
1775	Bredbo	...	19	...	955	Newman's Early	12	5	42
1790	Bruce	...	71	..	1277	Niloe	36	...	..
421	Bunyip	0	0	0	1635	Nizam	14		...
1728	Cadia	...	108	...	1800	Nolba	0	0	0
914	Caliph	0	6	44	1769	Noongaar	28	6	27
709	Canberra	52	95	..	1609	Nugget	..	69	...
1729	Canimbla	0	21	..	1435	Nungarin	36	...	...
1698	Capitol	...	85	..	1741	Omrah	...	59	...
1788	Cargo	..	43	...	1701	Parsee	77	...	...
1447	Carrabin	...	1	4	1468	Patriot	...	..	38
1507	Clarendon	3	7	4	1194	Queen Fan	0	0	4
228	Comeback.	3	0	20	1710	Rajah	2	4	9
1696	Confederation	3	0	15	1697	Ranee	17	12	60
1438	Dindiloa	...	...	0	1786	Riverina	...	4	9
1776	Dollar		9	..	1190	Roseworthy	9	...	..
1744	Dookee Delta	...	12	.	1695	Sepoy	..	7	...
1774	Duri	..	17	...	1445	S.H.J.	0	6	0
1773	Early Bird	..	32	...	1704	Sovereign	...	7	..
1702	Empire	...	96	...	1712	Sterling	83	..	.
1739	Exquisite	0	0	0	1199	Sultan	7	...	..
460	Federation	18	47	...	1690	Suola	..	37	..
223	Florence	0	0	4	920	Tob'ys Tusk	3	16	13
915	Ford	..	...	0	257	Turvey	9	...	...
1196	Fortune	16	...	...	1777	Union	..	85	...
1636	Gallipoli	9	21	...	1711	Viceroy	29	...	..
1442	Geeralying	0	0	0	1182	Wandilla	0	0	0
1511	Genoa	...	0	9	1637	Wannon	26	...	...
1713	Ghurka	11	9	20	1627	Waratah	74	...	...
1787	Gluclub (Smith & Son)	...	20	...	1756	Wardfir	..		23
1754	Gluclub (Victoria)	...	22	...	226	Yandilla King	0	0	20
1337	Gluyas Late	29	...	...					
1429	Golden King	...	17	31					
1088	Gresley	6	11	46					
1365	Hard Federation	26	...	...					
1750	Inderet	...	0	15					
1792	Joffre	...	7	89					
1706	Krithia	...	12	...					

The extreme variation in such varieties as Caliph-Newman's Early, etc. points to an unfixed factor of resistance to Flag Smut. Reference to the Line Resistance Test with Noongaar and Yandilla King, goes to prove this, as it will be seen that similar wide variation occurs between the resistance of the lines or strains under test.

VARIATION IN THE RESISTANCE OF LINES (OR STRAINS) OF STANDARD VARIETIES.

This section of the experiment was commenced in 1927, and that year included both susceptible and resistant varieties. The results, as given in the September Journal, pointed to the improbability of obtaining resistant strains of either Gluyas Early, Canberra or Merredin.

It was therefore decided to discard these and to concentrate on improving or at least maintaining, by selection, the resistance of the more resistant varieties and any new varieties that may be added. For this reason tests with Nabawa, Carrabin and Noongaar were continued and Baroota Wonder Early, Geeralying and Yandilla King were added. The latter three are being tested as part of the work in connection with the production of pedigree seed of these varieties at the Chapman Experimental Farm, and seed for the test was obtained from that farm.

The results are given hereunder:—

FLAG SMUT RESISTANCE TEST, 1928.

TABLE IV.—RESULT OF LINE RESISTANCE TEST WITH STANDARD PURE LINE VARIETIES.

Results given are Percentage of infection found.

Line and Family.	Baroota Wonder Early. P859.	Carrabin. P1437.	Geeraly-ing. P1442.	Nabawa. P1432.	Noongaar. P1769	Yandilla King P226.	Line.
	%	%	%	%	%		
Ia.	0	0	0	0	41	26	a
II.a ..	0	2	0	0	18	1	b
III.a .	0	0	0	0	22	32	c
I.b ..	0	0	0	0	39	18	d
II.b .	2	2	0	0	37	26	e
III.b .	0	0	0	0	37	7	f
I.c ..	0	0	0		28	15	g
II.c	2	0	0	0	9	27	h
III.c . .	5	0	0	0	18	12	i
I.d . .	0	0	0	0	31	22	j
II.d . ..	2	2	0	0	24		
III.d	2	0	0	0	31		
I.e	0	0	0	0	18		
II e .	0	0	0	0	24		
III.e .	5	0	0	0	28		
Average percentage of infection per line	1	0 4	immune	immune	27	20	
Variation in percentage infection per line	From 0% to 5%	From 0% to 2%	immune	immune	From 9% to 41%	From 7% to 32%	
Average percentage infection per family of 5 lines	Family I. 0% Family II.1% Family III. 2%	Family I. 0% Family II. 1% Family III. 0%	immune	immune	Family I. 31% Family II. 22% Family II. 27%		

These results exemplify the advantage of the method of selection carried out by the Department of Agriculture. It will be noticed that not only lines, but families of lines are detailed. By this means it is possible to select or reject a complete family of five lines, and selection is made from the three most resistant lines of the family having the lowest average infection.

"LINE" RESISTANCE TEST WITH NEW CROSSBRED VARIETIES.

This section includes both fixed un-named varieties and types that are still showing variation in type.

In this report it is only proposed to deal with such as are fixed in type, and undergoing definite trials under paddock conditions.

Previous tests have shown the possibility of obtaining resistant types by Cross-breeding, and having a number of types with one or both parents of a resistant variety, considerable time has been saved that would have otherwise been needed to obtain such types. As a matter of interest the results are given hereunder.

FLAG SMUT RESISTANCE, 1928.

TABLE V.—RESULT OF LINE RESISTANCE TEST WITH FIXED TYPES OF CROSSBREDS HAVING "NABAWA" AS EITHER PARENT

Results given are Percentages of infection found.

Line.	Nabawa x Bunyip M14.	Nabawa x Gluyas E. M20.	Nabawa x Carrabin M26	Nabawa x Carrabin M27.	Dindiloa x Nabawa M28	Dindiloa x Nabawa M30.	Gluyas E. x Nabawa M31	Florence x Nabawa M33	D.A.C. 4179 x Nabawa C84.
	%	%	%	%	%	%	%	%	%
1	0	4	0	0	0	2	0	0	11
2	0	2	0	0	0	0	2	0	8
3	0	8	0	0	0	0	0	0	32
4	0	10	0	0	0	2	2	2	8
5 ..	2	8	0	0	0	2	4	2	7
6 . .	..	...	0	0	0	2	4	0	13
7	..	...	0	0	0	0	0	0	15
8	.	...	0	0	0	0	0	0	6
9	...	...	0	0	0	0	7	0	9
10	..	...	0	0	0	0	2	0	9
11	..	..	0	0	0	0	9	0	7
12 .	.	.	0	0	0	0	0	2	6
13	..	..	0	0	0	0	0	0	4
14	.	...	0	0	0	0	0	2	0
15	..	...	0	0	0	0	2	0	9
Average percentage of infection per line	·4%	7%	immune	immune	immune	0·5%	2%	0 5%	9%
Variation in percentage of infection per line	From 0% to 2%	From 2% to 10%	immune	immune	immune	From 0% to 2%	From 0% to 9%	From 0% to 2%	From 0% to 32%

FLAG SMUT RESISTANCE TEST, 1928.

TABLE VI.—RESULT OF LINE RESISTANCE TEST WITH FIXED TYPES OF CROSSBREDS NOT HAVING "NABAWA" AS EITHER PARENT.

Results given are percentage of infection found.

Line.	D.A.C. 4179 x Quality C74.	Fortune x Gluyas E. C79.	Comeback x Florence M11.	Federation x Bunyip M18.	Florence x Carrabin M24.	Florence x Fortune M32.
	%	%	%	%	%	%
1	10	0	5	20	0	27
2	6	4	0	11	0	9
3	9	2	4	17	0	23
4	2	2	2	27	0	20
5	2	2	0	8	0	14
6	9	2	4	...	4	25
7	2	2	2	..	0	40
8	4	4	2	...	2	11
9	10	0	6	...	2	10
10	7	0	4	...	0	18
11	4	0	0	...	0	30
12	12	0	0	...	2	22
13	2	0	2	...	0	13
14	6	0	0	...	0	23
15	7	..	4	...	0	29
Average percentage of infection per line	6%	1%	2%	17%	0·7%	21%
Variation in percentage of infection per line	From 2% to 12%	From 0% to 4%	From 0% to 6%	From 8% to 27%	From0%to to 4%	From 9% to 40%

PASTURE DEVELOPMENT IN THE GREAT SOUTHERN AREA.

J. T. ARMSTRONG, B.Sc. (Agr.),
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One who has not seen the districts south of Katanning for a few years cannot but be struck with the great development which has taken place in this area, especially in some of the Cranbrook country which, until comparatively lately, was regarded by many as being absolutely useless. Now some of the finest clovers which the writer has seen are in this area and on country which looks too hungry and poor to grow any crop.

The improvement is not only noticeable in the fields but also in the spirits and hopes of the farmers. They are all enthusiastic about pasture development and are perfectly certain that they can produce economically all the feed which they require for their sheep, and that the long lean periods are a thing of the past. A fine spirit of optimism is noticeable throughout this area.

The writer had intended, whilst on his tour of crop judging for the local Agricultural Societies' crop competitions, to speak of the advantages of establishing pastures, but he had no need, and often indeed no opportunity, to mention it to many—they were all so anxious to tell him of what they had done on their farms and what their neighbours had done.

The great secret of success of pasture development is top-dressing and the subsequent growth of clovers of various varieties, chief of which is Subterranean Clover.

The general method adopted to establish a pasture is to seed 1lb. of clean Subterranean seed with an Oat crop. This is reserved for hay, and so the clover is given an opportunity to seed down. In the following autumn, it is top-dressed with from 80 to 180 lbs. super. per acre, and in nearly every instance a fine pasture is established.

Some paddocks are seeded on the surface with clean seed and top-dressed, and, provided the plants are given a chance to seed down the first year, a good pasture is assured in the second year. The winning crop in the Cranbrook Agricultural Society's Fodder Crop Competition was seeded down on top of an old pasture. Almost any class of country seems to carry good clover crops if the plants are given a chance to seed down the first year or two and are top-dressed. The poor gritty white gum country and the treeless plain country are all going down under clover. Some farmers are top-dressing and seeding on the burn after slashing the scrub, or even without burning where the scrub is very sparse, and so developing pastures with the lowest initial cost.

Apart from Subterranean, the main clovers grown are Drooping Flower, Cluster, Hop, Yellow Suckling clover, the common burr Trefoil, and some fine crops of Crimson clover were seen, notably at Mr. Hall's farm at Cranbrook and Mr. Egan's farm at Narlingup out from Kojonup. This clover makes a good hay crop standing tall and erect and so is easy to cut, does well on poor country, and will take a big part in developing and improving light and poor soils. Drooping Flower clover is a favourite, making good growth and seeding down well, and it is greatly relished by sheep and cattle generally. Yellow Suckling and Hop clovers seem to grow anywhere in the district, and, provided they are top-dressed, give a splendid yield of green feed or meadow hay.

The treatment of pastures varies slightly on different farms. Some farmers top-dress with 90 lbs. super; others give up to 180 lbs. in the autumn; some give two dressings of 80 to 90 lbs.—one in autumn and the other in the spring. The practice of two dressings, in the writer's opinion, is beneficial especially where the crop is to be cut for hay. The first topdressing to be given with the first rains, and when the feed has started well the sheep can be run on it until August, when they are taken out; a second dressing of 80 to 90 lbs. super is then applied, and the paddock shut up till the hay is carted. This early spring dressing makes a wonderful difference. Crops entered in the Fodder Crop Competitions which were treated in this manner were from 6 to 8 inches higher than the plots that had missed the second dressing.

The growing of clover crops for meadow hay is taking the place of oaten hay crops. This year many acres of pasture will be cut for hay, and next year far more meadow hay will be conserved.

Many inquiries were received from this area with reference to mowers and hay rakes, and the time to cut hay and how to cure it. The question of making silage was also discussed, but the practice of making hay is preferable with leguminous crops. These make mushy silage, and much of the valuable protein changes form and becomes more indigestible.

A large stack of meadow hay on a farm is the best insurance there is against a lean period. A block can quickly be cut from the stack with a hay knife and carted out to sheep or cattle, and they will eat up every straw. The hay can be thrown down on the ground or preferably into feeders of netting wire or slats; through the openings the stock will pull out all the hay they require. There need be no more starving times for the sheep from when the first rains come until the new green feed hardens up, as there has been in the past. Ewes can be hand-fed cheaply at lambing time. This means a stronger, healthier lamb; the ewe being in good condition will milk well, and the lamb will develop more quickly than it would with a starved mother.

Another big factor is smaller farms. Where a farmer on bush feed needed 4 acres or more per sheep, he can carry two or more sheep per acre on well developed pasture. He, therefore, can do with a smaller acreage. Farms will need more sub division. Big paddocks will not be necessary for economical working as when big machines were used. Smaller paddocks are more profitable for grazing than big ones; stock can be changed from one paddock to another more frequently, giving benefit to the stock and allowing the pasture an opportunity to grow.

The development has been very noticeable in the last few years, and it will be more noticeable in the future. We must all crawl before we can walk, and so with the farmers. They can only afford at first to seed down and topdress a small acreage and increase this year by year until the whole farm is under good pasture. The progress is much more rapid once a fair acreage is under feed, since the returns from the farm are much greater and more money is therefore available for further developmental work.

The development at present is almost wholly in the establishment of clovers, but some farmers are paying attention to getting in useful grasses. Along the railway Wimmera Rye grass is doing well on some farms and its use will spread. The big bulk of clover grown will considerably increase the nitrate content of the soil, and this will aid in the establishment of grasses. The decomposing vegetation and the sheep droppings will add greatly to the humus content of the soil, thereby improving its physical properties and increasing the water-holding capacity; consequently the crops will not dry off so quickly.

West of the Great Southern towards the area of heavier rainfall, Italian and Wimmera Rye grass should do well, and in the damper botoms Paspalum makes a stand. White Dutch clover and Lotus Major were seen in these damper areas, and this mixture—Paspalum, White Dutch and Lotus Major make wonderful pastures, holding out during the summer ready to grow with any summer showers and the early winter rains. East of the line where spring comes earlier, the early variety of Subterranean clover and possibly Wimmera Rye grass should give good feeding.

The following are details of crops entered in the Kojonup and Cranbrook Agricultural Societies' Crop Competitions:—

FODDER CROP COMPETITION, KOJONUP.

Points allotted.

——	Yield.	Freedom from Weeds	Evenness.	Clover Content.	Total.
V. Pailthorpe	49	16	13	13	91
Eulin Pastoral Company ...	50	16	11	12	89
W. Webb	27	15	8	12	62
J. Egan	27	16	5	13	61

V. Pailthorpe.—Soil gritty loam. Subterranean clover sown 5 years previous under oat cover crop. Top-dressed twice per year for last three years with 90 lbs. super. each dressing. This spring received 40 lbs. sulpate of ammonia in addition. Approximate yield per acre, 18 tons 14 cwt. green.

Eulin Pastoral Co.—Soil heavy red gum country. Old pasture which had been neglected, top-dressed twice per year with super. Yield approximately 19 tons per acre, green.

W. Webb.—Soil heavy loam, red gum and white gum. Subterranean clover seed sown with rape and oats in 1921. Top-dressed yearly with 90 lbs. per acre. This year two dressings of 90 lbs. each. Yield approximately 10 tons green. This plot was uneven due to places having been missed with the spring top-dressing.

J. Egan.—This crop was sown in April, 1927, with Subterranean clover under cover crop of oats; a little Crimson clover sown with the Subterranean. Top-dressed with 100 lbs. super. in autumn and again in spring 100 lbs. super. Approximate yield per acre 10 tons. Places had been missed with spring top-dressing, and this made the crop very uneven.

FODDER CROP COMPETITION, CRANBROOK.

Points allotted.

——	Yield.	Freedom from Weeds.	Evenness	Total.
D. Morgan	50	16	12	78
R. Lewis	46	16	13	75
T. Hall	47	15	12	74
W. Furness	35	13	8	65
W. Pope	32	16	9	57
Under two years old—				
D. McClean	50	14	9	73
Under one year—				
W. Furness	50	10	8	68

D. Morgan.—White gum country, gritty sandy loam. Sown with burr on top of old pasture five years. Top-dressed yearly 60 lbs. super. per acre; this year 90 lbs. super in autumn, 120 lbs. in August. Fed off with sheep till first week in August. Yield 3 sq. yards, 18 lbs. A particularly nice heavy crop. Yield approximately 13 tons per acre green.

R. Lewis.—White gum country. Subterranean clover sown with oats at rate of 1 lb. seed per acre in 1925. Topdressed twice per year—90 lbs. super. each dressing. Yield approximately 12 tons per acre green. Soil stiff red clay.

T. Hall.—Seed sown with oat crop in May, 1926, just over ½ lb. Subterranean clover seed and 1 lb. mixed clovers per acre with 90 lbs. super. In 1927 top-dressed in autumn and spring with 90 lbs. super. each dressing. This year received 1 cwt. super in March, 90 lbs. in September. In August harrowed with harrows upside down, twice and rolled. Yield per acre approximately 12 tons 14 cwt. per acre green.

W. Furness.—Timber red gum, white gum, little jarrah. Pasture down for four years. Top-dressed with super. Approximate yield per acre, 9 tons 14 cwt. green.

Under two years established.

D. McClean.—Country jarrah annd red gum, zamia palms and scrub. Sown with oats in 1927 as cover crop for Subterranean clover 2 lbs. per acre. Super. 1 cwt. In 1927 received 100 lbs. super. in autumn and again in spring. Soil light loamy, clay subsoil and only once ploughed. Yield per acre approximately 10 tons 16 cwt. green.

Under twelve months established.

W Furness.—Timber red gum, white gum, jarrah. Soil fairly stiff, ploughed once. Subterranean clover seeded with oats, 1 lb. seed per acre. Yield per acre approximately 3 tons 12 cwt. green. This promises to be a good pasture next year.

BEEKEEPING NOTES.

H. WILLOUGHBY-LANCE,
Apiculturist.

MOTHS AND FOUL BROOD.

The Greater and Lesser Wax Moths are often blamed for more than their share of destruction in bee hives. Owners of bees often say that moths are responsible for the loss of their bees, but in most cases it is due to inexperience or careless beekeeping. Even beekeepers of long standing make this mistake.

In the first place colonies must be kept strong with bees of a good pedigree. By this is not meant one body-box full of bees and one or two half empty supers on top. There must be plenty of bees on all combs in districts troubled with moth. As regards pedigree, most Italian strains are good battlers against the moth pest, some better than others. Secondly, a large number of home-made hives have not the correct spacing. In many cases the frames are too close to the bottom or sides of the hive. In others they are too close to the cover. In other words there is not what is called a bee space on all sides of the frame. The bees cannot get through and start filling the space with propolis. But the moth grub can and does get into these spaces and the bees, however eager they may be, cannot get at the grub.

In some cases beekeepers use mats of roofing felt, sacking or other material over the top of the frames, the bees cannot get between the mat and the frame, but the grub can and does. These mats are also a harbour and nesting place for ants. In one case recently out of 16 hives with mats on, 15 had ants' nests with thousands of eggs between the mat and the cover.

In normal cases strong colonies should have an entrance of ⅜in. deep by the full length of the hive, but if the colony becomes weak the entrance should be contracted by placing a strip of wood along the entrance, reducing this according to strength from the full entrance down to two inches. This will assist the bees to guard the entrance against the moths and robber bees.

If, however, the colony becomes very weak it should be united to another colony. Two weak ones united stand a chance of building up to one strong colony, but if left alone will probably succumb to moths or robber bees.

Do not leave hives more than twelve months without cleaning the floor boards; excessive accumulation of cuppings or refuse is a harbour for moth grubs. Once a year at least the floor boards and interior of the hives should be scraped and scrubbed with a solution of Izal; one part of Izal to 300 parts of water will be strong enough. Then leave to dry in the sun.

Always remember that prevention is better than cure.

Dealing with the connection of Moths with Foul Brood, some people think that there is no connection between the two, and in more cases than one I have found that moths have been blamed for destruction which has really been due to Foul Brood. The moths had only come in afterwards. In the meantime robber bees came along and cleaned up the honey, and carried the infection to other hives.

In one recent case the owner found a hive empty, except for moths. He told me that he had fumigated this with bisulphide of carbon, and put a swarm into it. On examination nearly all the combs were found to have either infected larvae or dried up spores of Foul Brood. On examination of other hives they were found to have Foul Brood in the early stages. Probably all of these had started from the one empty hive.

Moral—do not blame the moths for all empty hives. The colony may have got weak through a failing or poor queen. The hive may have been so constructed as to assist the moth and hinder the bees, or Foul Brood may have been the cause of the loss of the bees.

The last cause is a very insidious and dangerous one, as it may cause the spread of this very infectious disease due to mistaken diagnosis.

As Foul Brood has been found in various parts of the State, it behoves all beekeepers to endeavour to correctly ascertain the cause of weak or empty hives. Any empty hives, with or without moth, should be carefully examined for the spores of Foul Brood in the brood combs, and if any doubt exists, a sample piece of the comb should be sent to the Department of Agriculture.

ELECTROCULTURE EXPERIMENT.

By I. Thomas and J. H. Langfield.

This is a continuation of the previous experiment conducted on the Merredin Experiment Farm.

On this occasion the apparati were transferred to another location and erected by a representative of the vendor. The land on which the experiment was conducted was Gimlet and Salmon running into Mallee. It was ploughed the second week in August to a depth of 4in., but received no further treatment until after rain in May, when it was disced twice with a Tandem disc. Planting took place on the 6th June. Seed 43 lbs. and super. 120 lbs. per acre. It was harrowed after the drill.

The results are appended:—

MERREDIN EXPERIMENT FARM

Electro Culture Experiment.

Variety—Gluyas Early.
Superphosph te—120lbs per acre

Seed—43 lbs. per acre
Date planted—5th June, 1928

——	Computed Yield per Acre								Percentage.
Plot ...	1.	2	3.	4.	5.	6.	7.	A'age.	
	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs.	bus. lbs	bus. lbs.	bus. lbs.	
Not connected with apparatus	19 4	..	19 28	...	19 20	.	19 28	19 20	100
Connected to Electroculture	...	19 12	.	18 56	..	19 28	...	19 12	99·22

COOLING CONTRIVANCES AND RECIPES.

Margaret H. Reeves—Domestic Science Centre—Perth

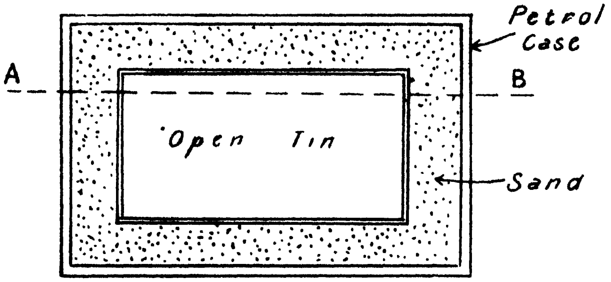
The importance of thoroughly effective apparatus for cooling food in hot weather cannot be over-estimated. The food we enjoy is that which combines careful cooking, dainty serving, and proper nourishment with pleasing flavours and appearance. A half-set jelly—be the flavour and ingredients ever so good—fails to please. Greasy butter is the most unappetising food possible. What one does not relish, loses a percentage of value to the individual. The well-known ice chests produce good results, and are more economical if kept packed with ice covered with newspaper or an "ice blanket," which may be purchased for about 2s.

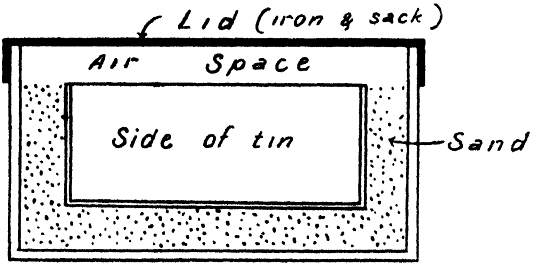
In districts where electric light is not installed and ice is not obtainable, our good friend the "Coolgardie Safe" comes to our aid, and with a small supply of water and a little care, is very effective. Pieces of hessian hanging over the sides allow for a better flow of water than flannel.

A cheap cooler may be contrived thus:—

1. Cut the side from a petrol tin. Turn in cut edge and hammer smooth.

— PLAN —





Section AB [front view]

2. Lay a petrol case on its side with open top towards you. Remove the side that now forms the top using two of these boards to close front to within an inch or two of the top.
3. Pack bottom of prepared case with thoroughly wet sand.
4. Place petrol tin in the case and fill in spaces between tin and box with sand, well wet and pressed down tightly.
5. Food is placed in tin and the whole covered with a clean wet cloth.
6. Make lid with a flat sheet of iron a little larger than top of box. Bend tin downwards by hammering at sides and ends to keep it in position.
7. Cover with wet sack.
8. Keep in airy place preferably near a tap.

Butter Coolers.

(*a.*) Place a brick in an old pie dish or tin containing a little water. Set butter on brick and cover with wet hessian large enough for ends to hang in the dish of water.

(*b.*) Stand vessel containing butter in a dish of water. Thoroughly wet a new flower pot and invert it over the butter so that it rests in the dish of water.

A butter box sunk in damp ground and covered with a wet sack forms quite a good cooler.

Gelatine Puddings.

Gelatine.—Very thin sheet gelatine or powdered gelatine should be used for following recipes. Half oz. of sheet gelatine is equal to three teaspoons of powdered gelatine.

Blanc Mange.

½ oz. gelatine, 1 pt. new milk, lemon rind, 1 tablespoon sugar.

Method :

1. Soften gelatine in a little of the cold milk.
2. Place remainder of milk with sugar and a piece of yellow lemon rind in white lined saucepan. Make hot.
3. Add gelatine. Do not boil. Remove from fire. When gelatine is dissolved remove lemon rind.
4. Pour into wet mould. Put in a cool place until set firm.
5. Serve in a glass dish with stewed fruit

Apple Jelly.

1lb. apples
1 lemon.
3 ozs. sugar.
½ oz. gelatine.
1 cup water.
colouring.

Method :

1. Dissolve gelatine in half the water.
2. Boil remainder with sugar, 1 teaspoon lemon juice and slice of yellow rind. Add prepared apples. Cook until tender. Rub through sieve.
3. Stir in gelatine. Mix well.
4. Turn half into wet mould. Colour remainder and pour on top.
5. When set, turn out and serve with cream.

Lemon Sponge.

½ oz. gelatine.
½ pint water.
2 lemons.
3 ozs. loaf sugar.
2 eggs (whites only).

Method :

1. Soak gelatine in water half an hour.
2. Put into saucepan with yellow rind of 1 lemon and sugar. Heat until gelatine dissolves.
3. Add lemon juice. Strain.
4. Leave to cool.
5. Gradually stir in well-beaten whites of egg. Beat until cold and thick.
6. Turn into wet mould.
7. When set, turn into glass dish. Serve with whipped cream—and half pint of custard made with the two yolks of egg.

Orange Jelly.

2 oranges, 2 ozs. loaf sugar, ½ lemon, ½ oz. gelatine.
½ cup water, white and shell of 1 egg.
1 inch cinnamon stick.

Method :

1. Soak gelatine in water ½ hour.
2. Peel off yellow rind of fruit and rub in sugar to extract oil.
3. Squeeze juice from fruit into lined saucepan. Add gelatine, water, sugar, rind, partly beaton white of egg and shell. (There should be ½ pint fruit juice.)
4. Whisk over fire until boiling. Take out whisk and simmer until clear.
5. Dip cloth in boiling water. Strain jelly through twice.
6. Turn into wet mould to set.
7. Serve with cream.

Siberian Cream.

½ pt. milk, ½ tablespoon sugar, 2 eggs.
¼ oz. gelatine, 3 drops vanilla or lemon essence.

Method :

1. Soak gelatine in milk ½ an hour. Bring nearly to boil. Add sugar.
2. Beat yolks of eggs well and gradually pour hot milk over it. Stir well.
3. Return to saucepan. Stir over fire until custard thickens. Cool.
4. Stir in beaten whites of egg to which has been added 1 dessertspoon sugar. Beat well.
5. Turn into wet mould to set.
6. Serve in glass dish with cream.

Note—When doubling the quantity, three eggs are sufficient.

Have you tried this Delightful Custard?

With

Don
JELLY CRYSTALS
ARTIFICIALLY COLORED & FLAVORED
Manufactured by FULCREEM Co PERTH WA

Serve them separately or together—
or with Cooked or Fresh Fruits,
Fruit Pies or Preserves.

METEOROLOGICAL INFORMATION.

STATIONS.	TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.	
	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum.		For Month.	Average.	Maximum.		Minimum		For Month.	Average.
	Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.			Mean.	Highest.	Mean.	Lowest.		
	SEPTEMBER 1928						OCTOBER, 1928						NOVEMBER, 1928.					
					inches.	inches.					inches.	inches.					inches	inches.
Chapman State Farm	68·7	79·0	47·5	38·5	1·39	1·69	72·4	86·7	48·8	40·3	85	99	85·8	103·4	55·9	48·1	·04	·27
Geraldton	69·5	77·0	50·8	44·0	·91	1·40	70·6	80·4	54·1	41·2	·50	72	77·7	100·4	59·0	50·2	·02	·26
Walebing	65·9	76·3	43·9	37·1	2·60	2·30	69·6	85·2	45·1	37·4	1·40	1·35	84·5	99·0	53·2	39·0	·33	·54
Perth	64·8	73·0	51·9	44·1	5·04	3·42	66·7	74·8	49·9	41·6	1·78	2·22	76·5	99·0	56·8	48·8	·41	·80
Kalamunda	65·8	72·0	48·5	41·0	6·39	4·69	66·6	80·4	47·5	38·2	1·84	3·31	77·5	97·0	54·4	44·0	·51	1·08
Bunbury	63·4	70·2	50·3	36·2	5·02	3·73	65·4	77·2	48·6	38·2	2·51	2·46	74·8	89·5	53·3	47·2	·52	1·03
Bridgetown	62·6	73·0	44·9	29·8	6·18	3·94	65·8	76·0	44·1	35·0	2·81	3·07	79·0	94·2	48·8	37·2	·46	1·14
Albany	62·1	69·4	48·1	41·4	6·21	4·11	62·3	72·4	49·5	42·0	3·35	3·27	68·0	85·4	54·1	46·4	·72	1·34
Merredin State Farm	67·5	81·0	43·7	31·8	·71	1·00	71·8	84·6	45·0	29·8	·19	0·84	86·8	100·5	55·0	42·0	*Nil*	·38
Northam	67·0	75·2	45·7	36·0	1·58	1·64	70·7	84·0	44·7	35·0	·61	1·00	85·0	101·0	53·9	42·1	·07	·40
York	66·9	74·0	45·4	34·0	1·60	1·64	70·3	83·2	44·3	34·0	30	1·05	84·3	100·0	53·1	40·2	·10	·44
Narrogin State Farm	62·6	69·2	43·1	30·5	2·28	2·33	66·0	78·8	42·0	29·8	·76	1·51	80·6	96·6	49·3	41·3	06	·57
Katanning	62·5	69·6	44·5	32·0	2·85	1·96	65·5	77·1	44·5	34·7	1·06	1·61	79·6	96·0	50·5	42·3	·16	·63
Cape Leeuwin ...	60·4	64·5	53·2	48·0	4·16	3·42	62·3	69·0	53·6	46·0	2·89	2·95	67·1	83·2	56·6	47·2	·58	1·24

MARKET REPORT.

Messrs. H. J. Wigmore and Company Limited, of 613-619 Wellington street, Perth, have supplied us with the following information regarding chaff available at the Metropolitan chaff and grain auction sales held in Perth, for the period, September to November (inclusive). In all cases the prices quoted are for f.a.q. to prime wheaten chaff, packed in new bags.

September—

Quantity—1,500 tons.
Minimum price—£6 15s.
Maximum price—£5 15s. per ton.

October—

Quantity—1,200 tons.
Minimum price—£6 10s.
Maximum price—£5 15s. per ton.

November—

Quantity—1,100 tons.
Minimum price—£6 15s.
Maximum price—£5 7s. 6d. per ton.

New season's chaff was late putting in an appearance this season and was not available until early in November. Consignments arriving at that date were scarce and the market firmed to £6 15s. per ton, receding as supplies became available, the following being closing quotation:—

F.a.q. to prime—£5 10s. per ton.
F.a.q.—£5 2s. 6d. to £5 5s. per ton.
Mediums—£4 12s. 6d. to £4 15s. per ton.

Oaten chaff:—Right throughout the period under review there has been a good demand for oaten at prices equivalent to wheaten, in fact at times it has been possible to secure more for prime samples of oaten.

Oats:—Very few consignments were available up to the end of October and good heavy feeds were selling at around 4s. 6d. per bushel. However, early in November, under weight of new season's coming to hand, the market eased. Prices, however, are still satisfactory, there being some demand for good clean heavy Algerians or Guyras at from 3s. to 3s. 3d. per bushel, light feeds being difficult to quit at lower prices.

Wheat:—The local market has fluctuated somewhat, there being a steady demand at around 4s. 10d. per bushel.

PRODUCERS' MARKET REPORT.

Producers' Markets, Ltd., report as under for Quarter ended 30th November, 1928:—

Fruit.

Supplies of Fruit increased for the period and values were satisfactory. Apples ex Cool Store were short and values firm. Valencia Oranges have been plentiful and good lines sold at satisfactory values, although values for medium and inferior lines were somewhat uncertain. Local Tomatoes increased in volume, and values throughout have been firm. Passion Fruit still continues short and high values obtained for any quality fruit. Lemons of prime quality showed a big improvement and with weather conditions favourable values should continue. Stone Fruits are now coming forward and the demand for good coloured fruit is good.

Vegetables.

Supplies of vegetables have been heavy for the period. At the commencement of the quarter Potatoes were short in supply and values were high. Very few country samples of any quality were coming through our rooms. We handled a good crop from the Wokalup District and these met with good competition, realising top values. Metropolitan crops are being dug and the sample is prime. Most crops are from the Certified Seed Scheme and all growers report good crops and satisfactory yields. We are submitting some picked samples and buyers are operating freely on these. The demand is easing now and when exporting ceases values will ease again. Brown Onions are coming forward in large quantities and values have settled down to 10s. to 12s. cwt. for prime Globes. White Onions are selling well, particularly good quality Silver Skins and Globes. Cabbage supplies have been heavy and the demand very weak. Any lines below prime are hard to quit at any price. Pumpkin shortened quickly during the period and values firmed to as high as 33s. cwt. New season's Turk's Cap is on the market now and the position will not be so acute. Cauliflowers were well supplied and some prime samples were offered. Values were high and the late crops were very satisfactory to the growers. Metropolitan Swedes were in steady supply and values were firm all along. Country lines were mostly of poor quality and the demand for these was very weak. Rhubarb supplies were plentiful and the demand good. Rhubarb growers were fortunate that apples were so short when their crop was so heavy. Values have eased with the marketing of soft fruits and are likely to be easy while supplies of peaches and apricots are plentiful. Cucumbers were forwarded in fair quantities and values were good. Marrows are in fair supply also and values good on account of the Pumpkin shortage. Bunch Roots were heavily supplied and the demand has eased with the coming of warm weather. Beetroot is in demand. Turnips are unsaleable. Lettuce is in good demand and prime lines are firm. Inferior sorts easy.

The supply during the past three months has been very heavy and, although W.A. exported 111,885 doz. eggs during this period, the supply on the local market was more than equal to the demand. The production which has held remarkably well is showing a falling off during the past few weeks. Local values at present are ranging from 1s. 4½d. to 1s. 7d. per dozen for specially graded eggs.

Poultry.

Heavy supplies of all lines, except Turkeys, have been coming forward and, although the quality has been very medium, the prices have remained high. Turkeys appear to be very short this year and as much as 60s. per pair is being paid for prime quality. Drakes showing quality are eagerly sought after and have realised as much as 20s. and 22s. per pair.

LIVE STOCK AND MEAT.

For the information of readers of the "Journal," the following particulars have been supplied by Messrs. Elder, Smith & Co., Limited, Perth:—

COMPARATIVE YARDINGS OF STOCK YARDED AT METROPOLITAN FAT STOCK MARKETS FOR SEPTEMBER, OCTOBER, AND NOVEMBER 1928.

—	September, 1928				October, 1928.					November, 1928.			
	5.	12.	19	26.	3	9	17.	24	31.	7	14.	21.	28.
Sheep & Lambs	8,635	11,942	8,230	8,801	12,891	14,524	15,543	15,292	13,232	14,396	10,791	12,126	18,792
Cattle .	838	638	813	610	493	618	630	619	634	711	889	709	879
Pigs	542	597	481	909	612	419	708	746	640	569	543	388	424

COMPARATIVE VALUES PER LB. OF STOCK SOLD AT METROPOLITAN FAT STOCK MARKETS DURING SEPTEMBER, OCTOBER, AND NOVEMBER, 1928.

—	September, 1928.				October, 1928.					November, 1928.			
	5.	12.	19.	26.	3.	9.	17.	24	31	7.	14.	21.	28.
Mutton	9½	10	10	11	7½* 11†	6* 9½†	6*	6	6	6	6¼	7	6½
Beef ...	6½	7¼	8	8¼	9¼	8¾	7½	8	8¼	8	8½	8	7¼
Pork ...	13	13½	13½	13½	13½	13½	13	12¾	11¼	11	10½	10½	10¾
Bacon	10	10¼	10¼	11	11	11	11	10¼	9¼	9¼	9	9¼	9¼

* Shorn. † Woolly.

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